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Electric Drive On Collier

The Jupiter, Building at Mare Island, Will Be Equipped With Electric Propelling Machinery—Description of the Drive

The Jupiter is one of the new government colliers and is a sister ship to the Neptune and Cyclops. The Cyclops is equipped with reciprocating engines and the Neptune with a turbine drive connected to the propellers by gearing. These ships have a displacement of about 20,000 tons and carry something like 12,000 tons cargo. They are designed to operate at 14 knots. The Cyclops in her 48-hour trial averaged 14.6 knots, with a coal consumption for the main engines only of 1.485 lbs. per I. H. P. per hour, the total I. H. P. of both engines in this run being 6,705. The average speed of propellers was 92 R. P. M. The results of trials of the Neptune cannot be given here but the fact has been published that her performance was not as good as that of the Cyclops, the difference being attributed to less efficient propellers and to inefficiency in the turbine. It is reported that the gearing works in an entirely satisfactory manner.

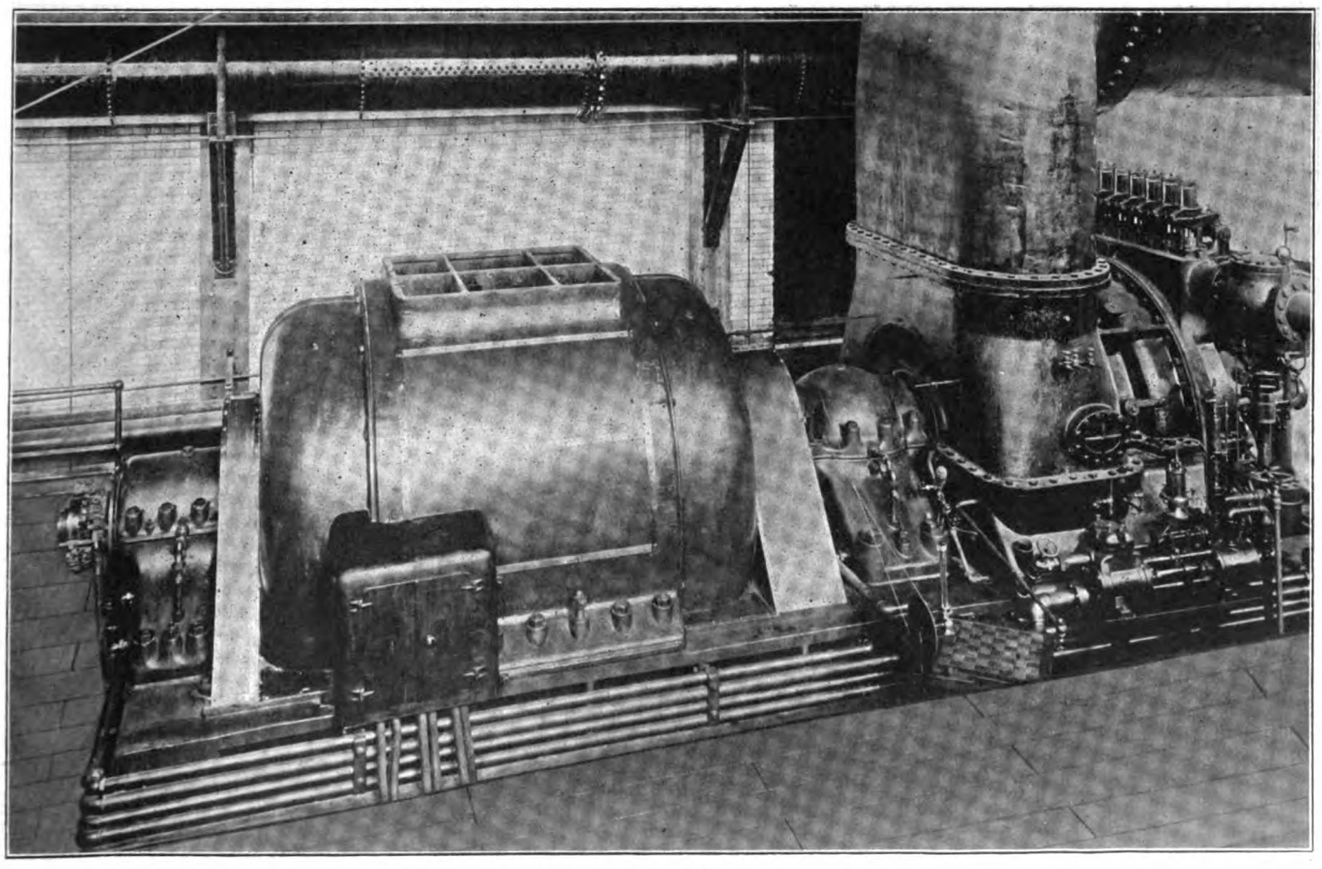
The following table shows comparisons of the known data concerning the equipments of these three vessels:

	Cyclops.	Jupiter.	Neptune.
Displacement, tons.	20,000	20,000	20,000
I. H. P., 14 knots.	5,600	.....	.....
Engine or turbine speed, 14 knots, r. p. m.....	88	2,000	1,250
Propeller r. p. m., 14 knots	88	110	135
Weight driving machinery, tons..	280	156	.....
Steam consumption in lbs. per S. H. P. hr.	†14	*12	.....

Character driving machinery—Cyclops: Two triple expansion engines.
Character driving machinery—Jupiter: One turbo-generator and two motors..
Character driving machinery—Neptune: Two turbines each with gearing.

†Estimated. *Tested.

The collier Jupiter, which is being built at the Mare Island Navy yard,



GENERATING UNIT, UNITED STATES COLLIER JUPITER

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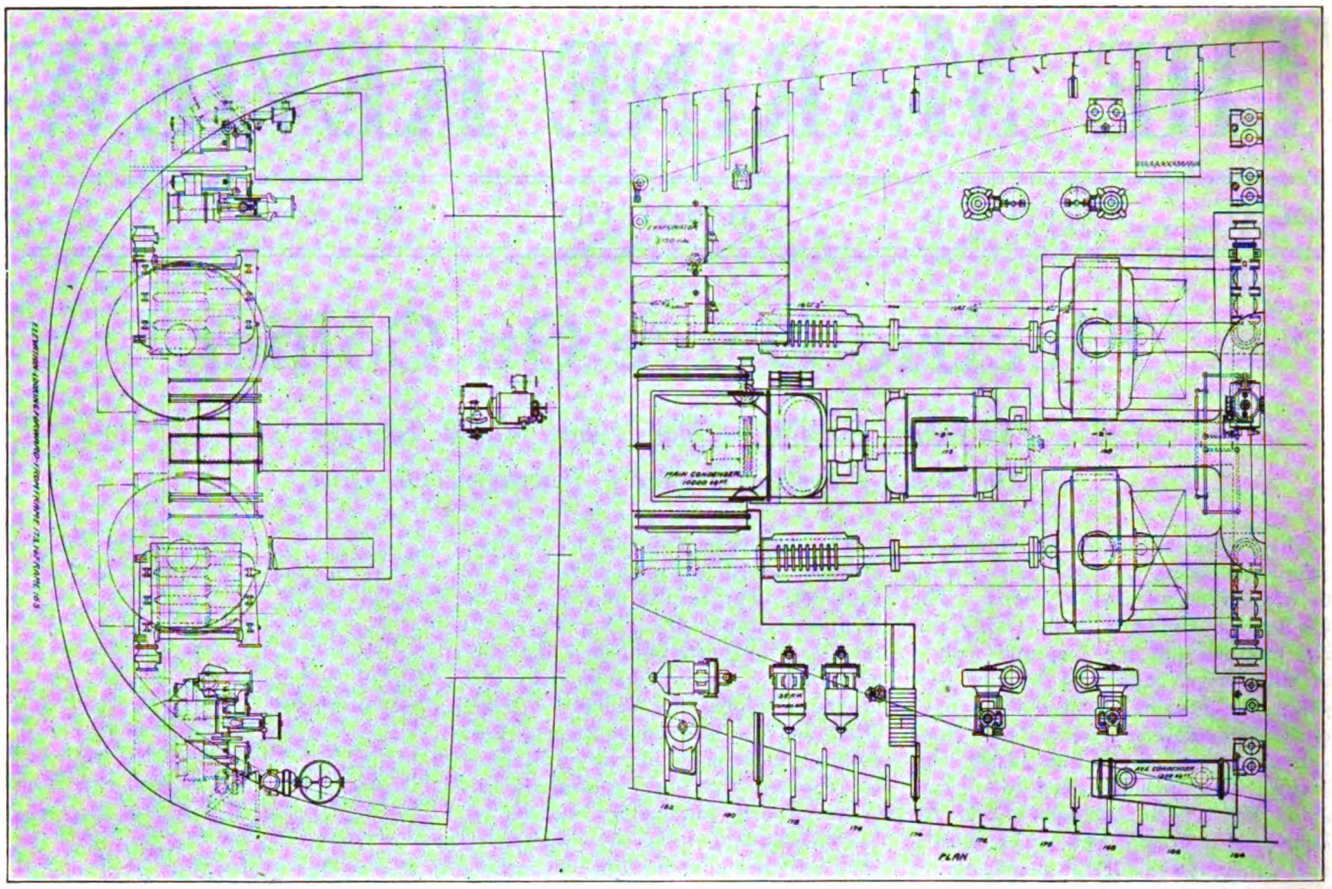

ARRANGEMENT OF MACHINERY, COLLIER JUPITER, ELECTRIC DRIVE

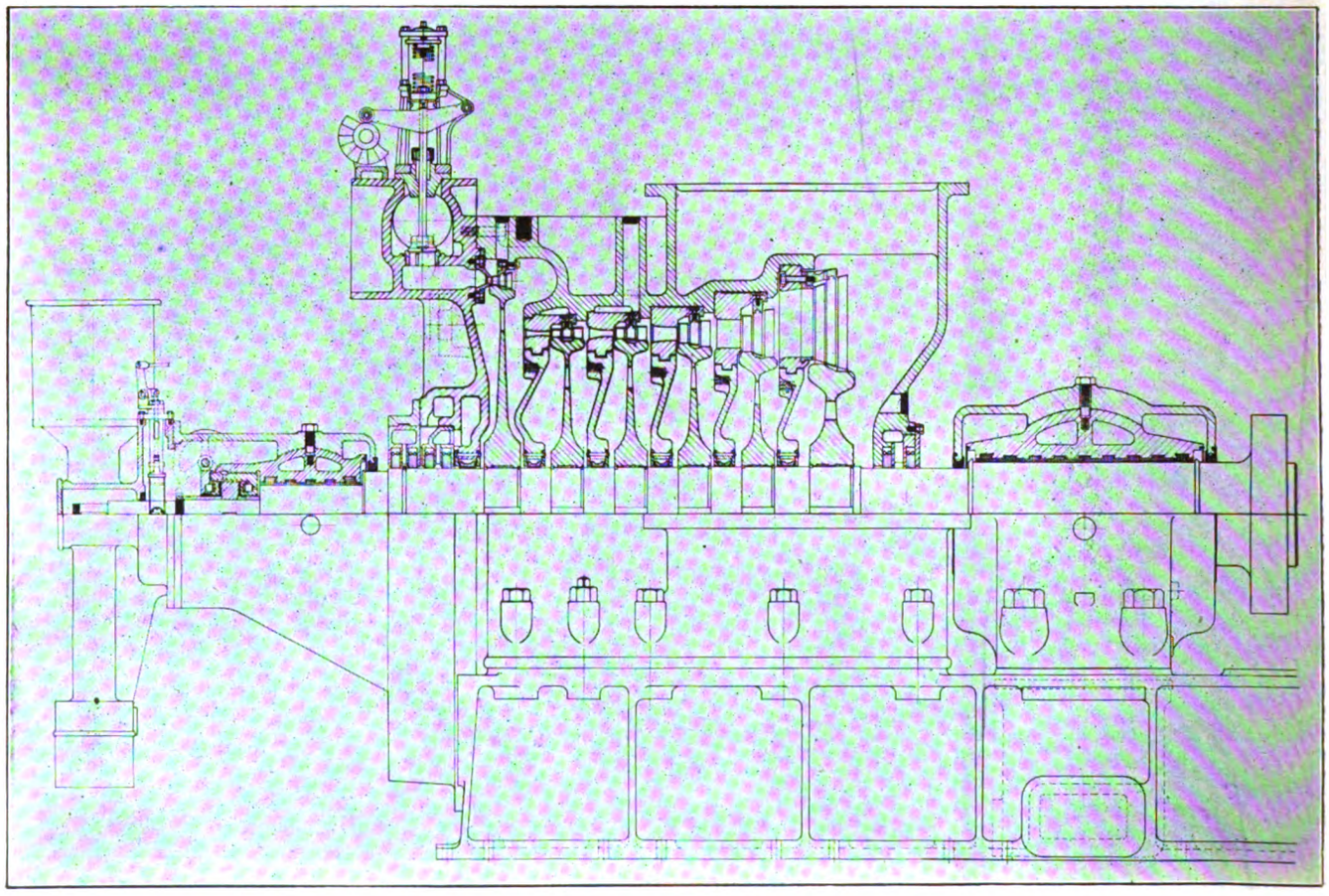

DIAGRAM OF JUPITER TURBINE

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is to be equipped with electric propelling machinery designed by W. L. R. Emmet and built by the General Electric Co. The generating unit consists of a 6-stage Curtis turbine connected to a bipolar alternator, the speed of this unit at 14 knots being about 2,000 R. P. M. and the voltage about 2,200. This generating unit delivers electricity for two motors, one mounted directly upon each propeller shaft. These motors have 36 poles, therefore the ratio of synchronous speed reduction is 18 to 1, the propellers at 14 knots being designed to operate at 110 R. P. M. In addition to this apparatus there is a switchboard equipment which provides oil switches for connecting the motors for either direction of rotation and instruments which show and record the electric power delivered to the motors. There are also two water-cooled resistance devices which are put in circuit with the revolving part of the motors in the process of reversing. Connections for the insertion of these resistances are made by sliders on the motor shafts operated by levers attached to the motor frames.

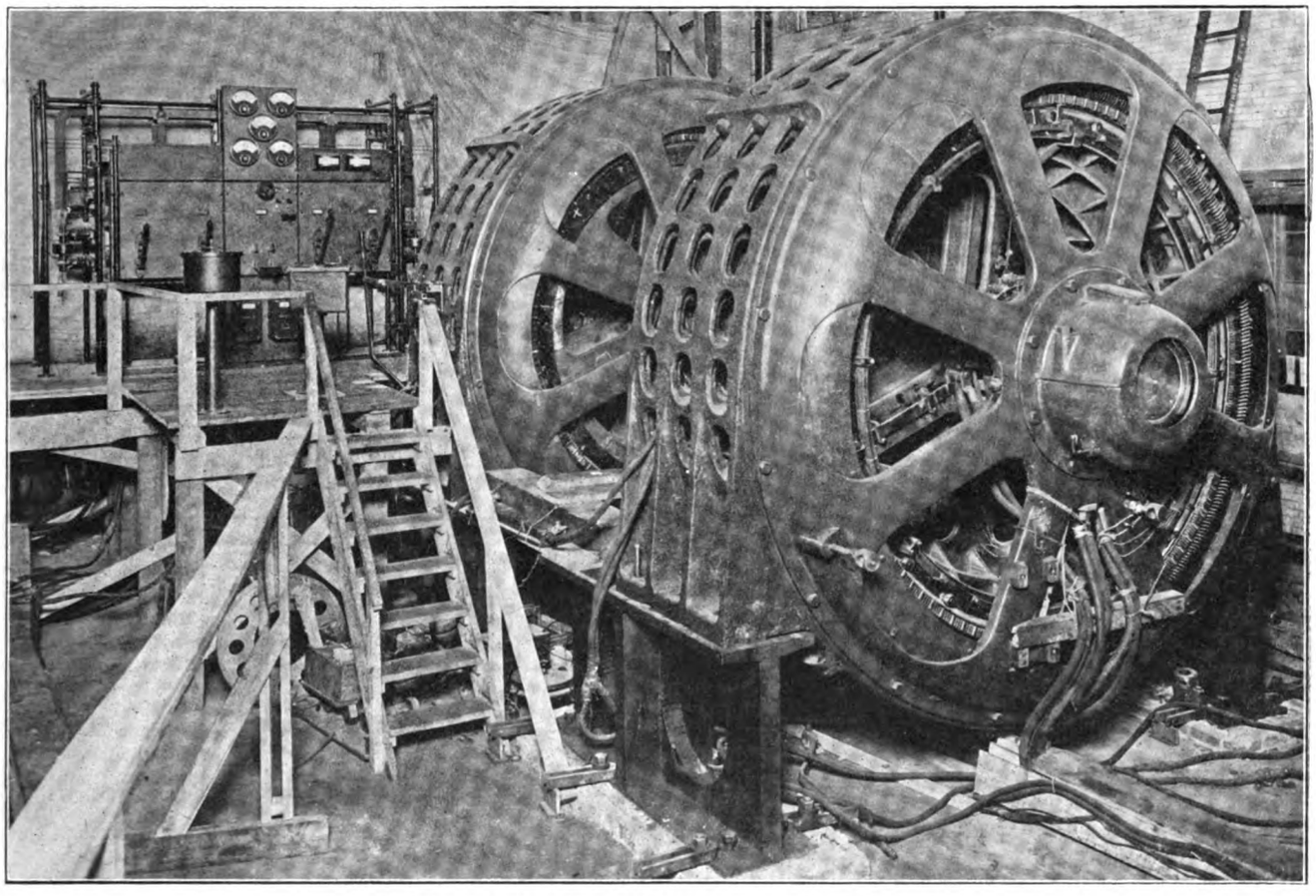
The generating unit and motors are self-lubricating and self-ventilating. Sheet metal ducts will be connected to their air outlets in such a manner that the heated air will be led to the suction of the fire room blowers so that it will not be released in the engine room.

Safety Interlocks

Since in such an equipment it is only necessary to make such electricity as is required for the actual driving of the ship, it is possible to so design the equipment that the maximum power which can be delivered by the generator is not greatly in excess of that of the regular requirements, and this fact practically overcomes the possibility of destructive trouble through wrong connections. It has, however, been thought desirable to arrange interlocks in such a manner that wrong connections cannot be made, the conditions being such that these interlocks involve no complication or uncertainty. Provision is thus made by which the go ahead switch and reversing switch cannot be closed at the same time and by which neither switch can be closed unless the resistance is in circuit with the motor secondary. For the levers which operate the connection and disconnection of the resistance, magnetic locks are attached which are energized by the field circuit of the generator. These locks prevent the movement of these levers until the generator has lost its field, and thus prevent any possibility of burning of contacts through movements at the wrong time or in the improper manner.

Speed Control

The speed of the motors in this vessel will be changed by variations in the speed of the generating unit, the ratio of speed reduction remaining fixed. The changes of speed, however, are not made by throttling as is usual with ship turbines. The turbine is equipped with a governor of novel construction which is so arranged that it is capable of automatically holding the speed at any point from about 5 knots up to the maximum. The setting of this governor is accomplished by the movement of a fulcrum which is controlled from a point near the switchboard and operating levers. Thus the operating engineer, without changing his position, can run the vessel at any desired speed ahead or astern, can stop and start, and from his instruments can see the speed and amount of power delivered to each propeller. When the apparatus is installed in the ship, arrangements will also be made by which in the same po-



TYPE 1-36-2,750-110-2,300 VOLT MOTORS, UNITED STATES COLLIER JUPITER

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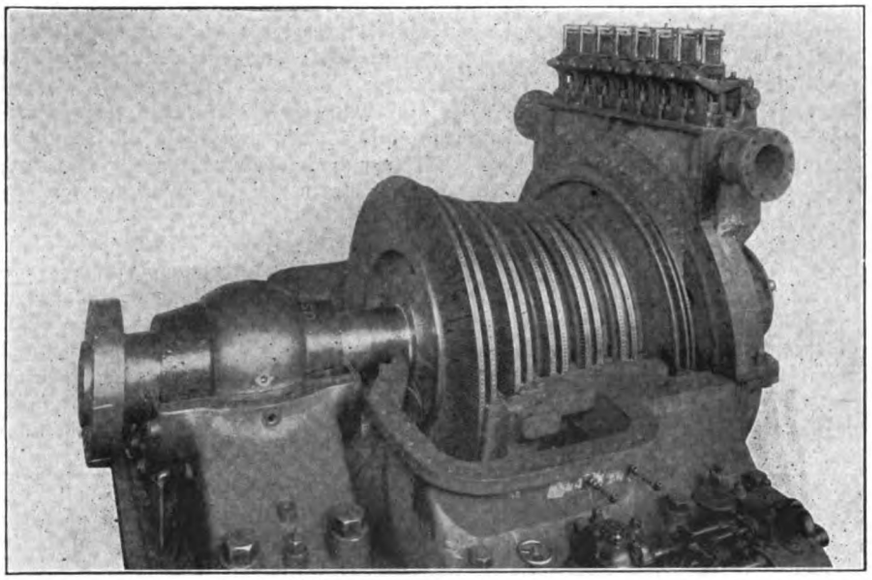


4,000-KW 6-Stage Curtis Turbine for Collier Jupiter—Mid-Bearing Cap and Top Intermediate Holder, Intermediate and Nozzle Removed

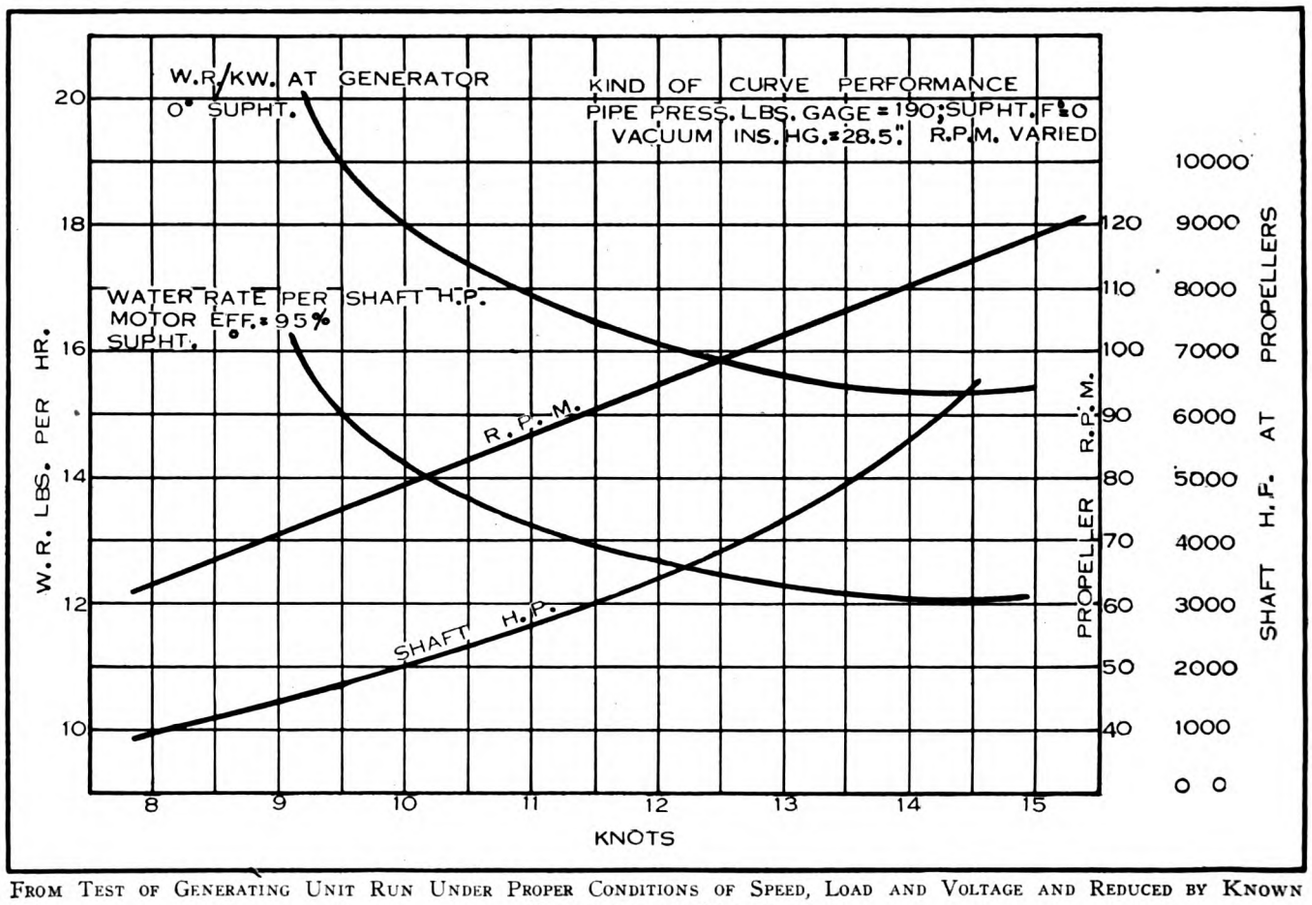
sition he can open and close the main throttle valve by hand or can trip it so that it closes instantly. The generating unit is also equipped with a simple automatic device entirely separate from the governor which trips the main throttle in case the speed of turbine exceeds a certain predetermined limit.

Electrical Conditions

The electrical methods used on this ship constitute the simplest known form of electric power transmission, and apparatus of similar character is used for a great variety of purposes on shore under conditions far more complicated and difficult and with an immunity from trouble which is practically complete. In many years of production of alternating apparatus of this general character and voltage, there has hardly been a case of insulation failure recorded and an investigation of this fact will convince any one that the electrical part of this equipment is particularly reliable and that in this respect it is far superior to the types of apparatus which have been used for ship propulsion. Furthermore, its nature is such that in the event of trouble, it could be very easily and quickly repaired. The switching apparatus is of an entirely reliable standard type, it can be easily replaced or repaired if it should get out of order, and if it were all removed the ship could be easily operated with temporary connections.

The turbine is so designed that all of its parts are accessible and replaceable and extra parts are carried on the vessel, so that it seems impossible that the machine could be subject to any serious interruption of service. While it is normally operated on the governor as described, it is in no way dependent upon it since by a simple disconnection it can be operated by the throttle from a point near the switchboard and motor levers. The turbine has six separate stages and in the event of loss of blades in one or more of these stages, it could quickly be arranged to operate on the remaining stages without any renewals. Any one stage of the turbine would propel the ship above half speed.

Turbines similar to this have practically replaced reciprocating engines for most uses on shore and much experience



From Test of Generating Unit Run Under Proper Conditions of Speed, Load and Voltage and Reduced by Known Efficiency of Motors

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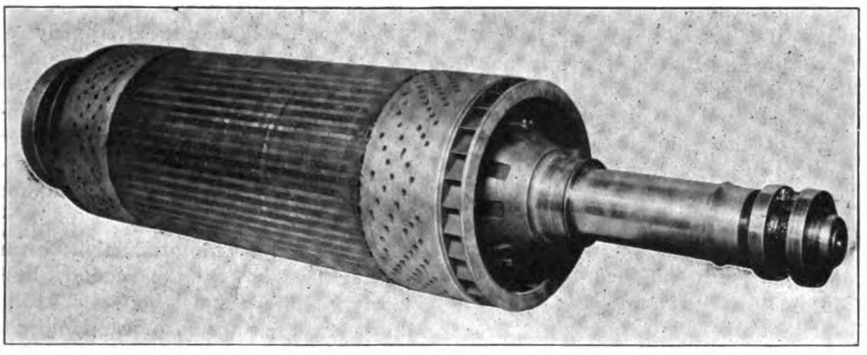
has shown that in the matter of reliability and low maintenance cost, they are superior to any form of prime mover which has been used.

Tests Made in Schenectady

The apparatus is set up in the General Electric Co.'s power station, the turbine being connected to a condenser and one motor being installed in the same position which it will occupy on board ship with relation to the switchboard and controlling mechanism. The other motor is arranged as a generator and is



REVOLVING FIELD FOR UNITED STATES COLLIER JUPITER

coupled to the first motor so that it affords load for it. With this generating motor as load, the conditions of service can be approximated although they are more difficult than the driving of a propeller, since the load falls off only slightly with diminutions of speed unless its exciting current is reduced. With the apparatus so installed the processes of starting, stopping, speed variation, and reversal can be accomplished very much as they would be on board ship and the time and difficulty involved can be correctly judged. The motor can be operated at its full load or any desired proportion of this load and at any desired speed, variation being accomplished by mechanical connection to the governing mechanism of the turbine equivalent to that which will be used on board ship.

This arrangement affords means of experimenting with the operating conditions, but does not afford means of testing water rates, since only one motor can be loaded. The water rates of the generating unit have been tested under all loads and conditions by delivering its power to a water rheostat in the usual manner, and the record of these tests is shown by the accompanying curve sheet. In these tests the effects of speed, voltage, vacuum, and superheat were all thoroughly investigated and a series of tests run under almost exactly the conditions of load, speed and voltage which will be characteristic of the ship's operation. The tests were made under exact conditions of steam pressures and vacuum specified for the ship.

Performance of the Selandia

The motor-driven ship Selandia, which sailed from London on her maiden trip on March 2, returned to London on July 15, having covered a distance of 21,086 miles, touching at Antwerp, Genoa, Port Said, Colombo, Penang, Singapore, Bangkok and returning via Singapore, Penang, Colombo, Port Said, Genoa, Aarhuus, Kiel, Copenhagen and London. She attained an average speed of 11 knots on 9½ tons of fuel per day at a cost of about $7.68 per ton. The total consumption for the round trip was 800 tons. This is the longest voyage ever undertaken by a motor-driven ship and naturally great interest was evinced in her upon her return to London. The owners state that no trouble whatever was experienced, the engines maneuvering with absolute certainty. The piston rings were only examined twice on the voyage and they and the cylinders were found to be perfectly clean. The exhaust valves, which consist of cast iron heads on steel stems, were also examined twice, most of them needing no attention, some being just cleaned and ground in. The voyage seems to have brought out no inherent defects in the principle of the four-cycle motor, such for instance as the sticking of the valves, the gumming of the piston rings or failure to reverse, as had been feared by many.

At any rate, the Selandia has demonstrated that 9,300 tons of cargo can be transported a distance of 21,840 miles on a consumption of 9½ tons of fuel per 24 hours, with a total engine crew of ten men and three boys and without any sacrifice of reliability or maneuvering capabilities in the ship.

On the other hand information comes from abroad that the Jutlandia, sistership of the Selandia and the first motor-driven vessel to be actually engined by a British firm, has not been altogether successful. Information is not at present obtainable as to the exact nature of the trouble.

It is known, however, that the American - Hawaiian Steamship Co. has abandoned its intention of installing Diesel engines in the three latest steamers placed with the Maryland Steel Co., and will install geared turbines instead.

Meanwhile the Clyde Shipbuilding & Engineering Co., Port Glasgow, Scotland, has launched the motor-driven package steamer Fordonian, for Norcross & Co., Toronto, and will equip her with Diesel oil engines built by themselves. This vessel will be given most extensive trials before she is sent across the ocean and it is not probable that she will reach the lakes before October. The Fordonian is 250 ft. long, 42 ft. 8 in. breadth, 16 ft. 10 in. deep to main deck and 26 ft. 6 in. deep to awning deck.

The Toiler, the first oil-driven vessel to reach the lakes, has again been placed in commission since her recent stranding. She is regarded in the nature of an experiment. She is rather slow, her actual speed being about 6 knots.

New Steamers for United Fruit Co.

Capt. William Anderson, manager of the marine department, United Fruit Co., Boston, advises that the company now has under construction at the yard of Workman, Clark & Co., Ltd., Belfast, Ireland, three ships for passengers and freight, about 8,000 tons each. Their approximate dimensions will be: 487 ft. in length, 55 ft. in breadth and 33 ft. 6 in. in depth. They are being designed for a speed of 16 knots.

When these steamers are completed the United Fruit Co. will have, including its English operating company, Elders & Fyffes, Ltd., a total of 37 refrigerated steamers of its own, all of which are new boats constructed within the past few years. Of this number 21 are operated by the United Fruit Co. and 16 by Elders & Fyffes. The distinction is not important as the English subsidiary is entirely owned by the fruit company. These 37 boats represent an investment of $18,000,000, which at the end of a 10-year term will have been entirely liquidated through sinking fund operations. In other words, the United Fruit Co. will ultimately have an investment of $18,000,000 without a dollar of capital against it.

The submarine F-4, which was built at the yard of the Seattle Construction & Dry Dock Co., Seattle, Wash., underwent her contract trials recently successfully.

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Steamer Thousand Islander

Designed to Care for the Tourist Traffic of the Thousand Islands — Built in Record Time by the Toledo Ship Building Co.

THE Toledo Ship Building Co. recently delivered the steamer Thousand Islander to the Thousand Island Steamboat Co., which has recently been taken over by the Richelieu & Ontario Navigation Co., and will hereafter be known as the Richelieu & Ontario Navigation Co.'s lines operating in conjunction with the New York Central railway system. The Thousand Islander has been specially designed to take care of the tourist traffic of the Thousand Islands and while the contract was not let to the Toledo Ship Building Co. until last spring she was delivered in July in ample time for the season's business, a notable record in dispatch. The leading particulars of the Thousand Islander are as follows:

Length over all, 172 ft. 9 in.; keel 164 ft.; depth 9 ft. 6 in.; gross tonnage, 355, and net tonnage, 241.

The new steamer is of the tunnel stern, shallow draft twin screw type with main, promenade and boat decks, having accommodation for 1,000 passengers. The hull is constructed of steel up to the main deck, the superstructure, including cabins, being of wood. The steel hull is divided into six compartments by tranverse bulkheads, three being water tight and two non-water tight. The main engines, of which there are two, are of the two-cylinder type, 15 and 30 in. diameter by 20 in. stroke, supplied with steam from two single-ended Scotch boilers, 12 ft. 6 in. by 10 ft. 6 in.

Details of Hull Construction

The peak bulkhead at frame 16 is made up of 10 lb. plate, stiffened in a vertical direction by 3½ x 2½ x 6.1 angles and in a horizontal direction by 2½ x 2½ x 4.1 angles. The plating of water tight bulkheads at frame 26 and 66 runs from 12½ lbs. below 6 lbs. above. Horizontal and vertical stiffeners are all 2½ x 2½ x 4.1 lbs. The bulkhead at frame 44 is non-water tight and separates the boiler from the engine space. It is built up of 6 lb. plate stiffened vertically by 2½ x 2½ x 4.1 angles and horizontally by 3½ x 2½ x 7.2 angles. The engine space is separated from the after hold by a non-water tight bulkhead at frame 55; it is built up of 14 B. W. G. plate and stiffened vertically and horizontally by 2½ x 2½ x 4.1. Double angles are used in connecting the water tight bulkheads to the shell, while single angles are used for those that are non-water-tight. Diamond shaped lines are fitted to all bulkheads in way of outside strakes of plating. There are two coal bunkers placed on opposite sides of the ship and having doors that open into the fire hold. The starboard bunker extends from frame 36 to 44 and the port bunker from 26 to 35. The bunkers are built up of 6 lb. plate stiffened vertically by 2½ x 2½ x 4.1 angles spaced 24 in. keel to keel.

Sheathed with Rock Elm

The boiler casing consists of 6 lb. flanged plate built up from 10 lb. coamings. The plates are flanged the necessary depth to do away with the angle stiffeners. The shell plating includes the garboard strake of 11 lb. fore and aft, bilge and bottom plate 10 lb. fore and aft. Strake next below the sheer strake 11 lb. fore and aft, while the sheer strake is 12 lb. for 2/3 length amidships reduced to 11 lb. at the ends. The keel plate is flat, being 30 in. wide x 15 lb. fore and aft, and worked in lengths of not less than 7 frames spaces. The butts are double riveted; a single inside 18 lb. strap being fitted extending to the garboard edge laps. The garboard, bottom and bilge strakes are butt lapped, double riveted, ⅝ in. rivets being used. The side and sheer strakes are butt lapped, double riveted, ¾ in. rivets being used. The fore and aft edge laps of the garboard and sheer strakes are double riveted, the remainder are single riveted.

The under body of the boat is sheathed with rock elm 2½ in. thick. The sheathing extends from between frames 15 and 16 to frames 66 and 67 and extends upward to the turn of the bilge. After the shell plating had been caulked, the wood sheating was fastened in place by means of bolts and nuts and the bottom was then caulked in the usual manner. The floors, 12 in. deep, are solid on every frame, being formed of 10 lb. plates, with the exception of the engine and boiler space where they are increased to 14 lb. Deep floors are provided for the engine space and also for the ends of the ship. The frames are formed of 3 x 2½ x 4.5 lb. angles and spaced 24 in. keel to keel. The reverse frames forward and aft of the engine and boiler space are 2½ x 2½ x 4.1 angles extending alternately to the main deck stringer plate and to the upper turn of the bilge. In the engine and boiler space they are increased to 5 lb. and all extend to the main deck stringer plate, while additional reverse frames are fitted for the length of the floors.

There are two longitudinal keelsons on each side of the center line, worked intercostal between solid floors on each frame. The longitudinals are formed of 10 lb. vertical plates whose lower edge is flanged and riveted to the shell, while the top edge is riveted to a 6 in. x 10.5 lb. channel which extends fore and aft over the tops of the floors to which it is attached by angle clips.

The channels are continuous fore and aft and are not cut in the way of bulkheads. Bracket connections are made at all the bulkheads besides the necessary water tight construction. The longitudinals are carried as far forward as practicable and as far aft as the stern, where they help to stiffen the roof of the tunnel.

The bilge and side stringers are formed of a 6 in. x 10.5 lb. channel connected to the frames by 2½ x 2½ x 4.1 lb. clips. The channels are slotted in way of the frames and cut at the bulkheads to which they are attached by suitable brackets. The outer flange of the channel is connected directly to the shell, while the channel itself is fastened to the frames by angle clips. At the stem the stringers are connected by 10 lb. plate breast hooks together with the necessary angles.

Engine Foundation

The foundation for the engines is formed mainly of four longitudinal girder plates, each of 10 lb. intercostal, between the floors to which they are attached by means of double angles 2½ x 2½ x 4.1 lb. The girder plate itself extends to the shell to which it is connected thereto. The rider plates are continuous and formed of 20 in. plates 15¾ in. wide connected

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to the floor plates and longitudinals, thereby tying the whole together.

There are two saddles for each boiler consisting of 14 lb. plate and double angles 3 x 3 x 7.2 lb. The fore and aft saddles for each boiler are connected by 14 lb. plate girders to which they are connected by 2½ x 2½ x 5 lb. angles.

The main deck beams are of angle steel 5 x 3 x 8.2 lb. placed on every frame to which they are connected by 10 lb. gusset plates 15 in. x 15 in. The camber is 6 in, 32 lb. The main deck stringer plates are 18 in. x 10 lb. for 2/3 length amidships reduced to 8 lb. at the ends. They are fitted close to the sheer strake plating and connected thereto by a 6 in. x 14.52 lb. Z bar. The top edge of the sheer strake is flanged outward to receive the lower flange of the Z bar while the deck stringer is connected to the upper flange of the bar.

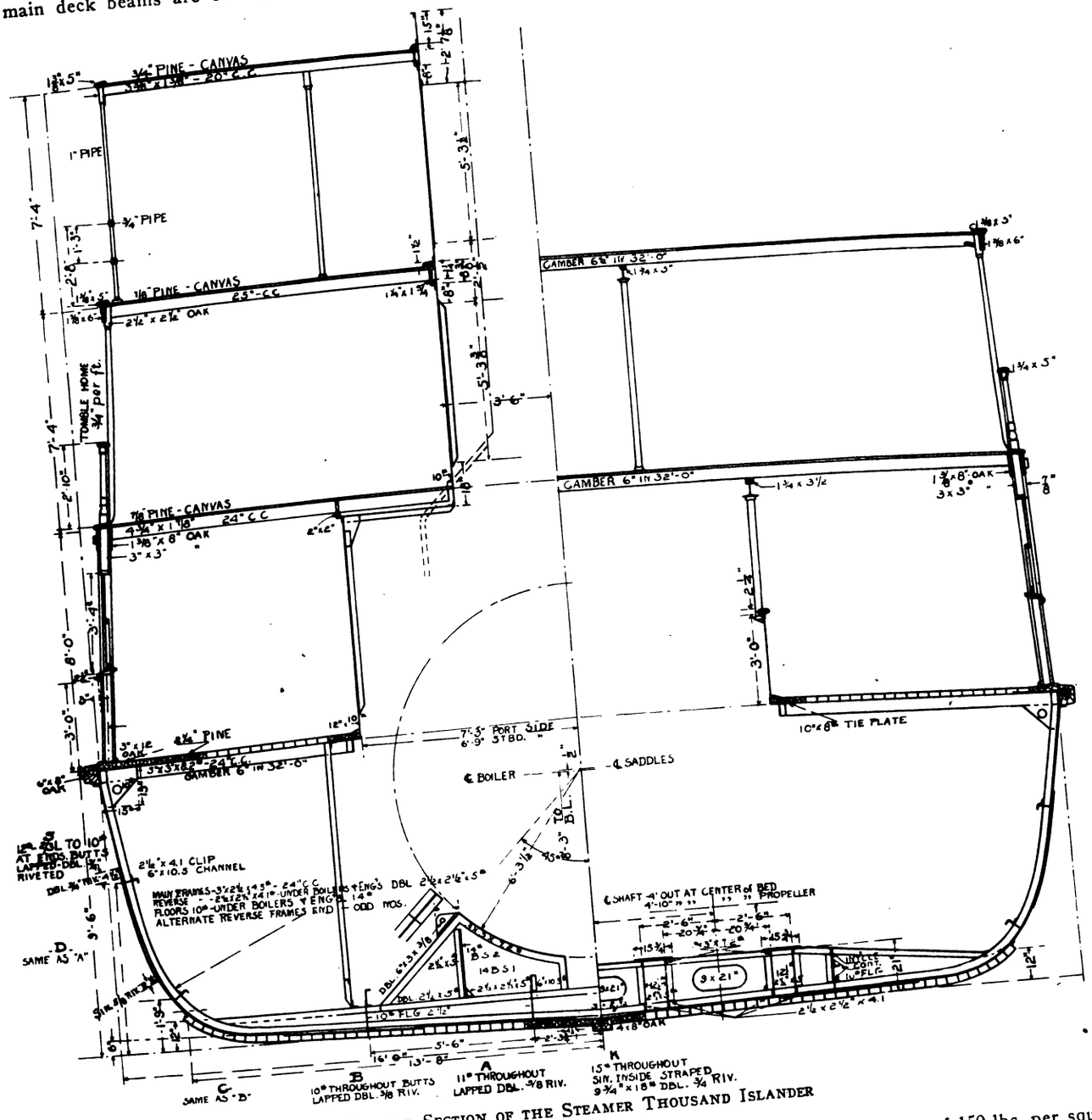
The only plating on the main deck, other than that of the main deck stringer is that due to the reinforcement of hatch openings in the way of boiler and engine space and stairways. The main deck is of pitch pine 2¼ in. thick x 3¾ in. wide, laid in long lengths, and well fastened to the beams and plating by ½ in. dia. cheese head, square necked, galvanized bolts and nuts. An oak fender strake 6 in. x 8 in. is placed on a line with the main deck and extends around the stern to as far forward as the stem.

Machinery Equipment

There are two main engines of the two cylinder, vertical, direct acting compound type, well balanced and each capable of developing about 500 I. H. P. at 200 revolutions per minute, from a steam pressure of 150 lbs. per square inch.

The sequence of cylinders, beginning forward, is high pressure and low pressure, with diameters, respectively, 15 and 30 in. and a common stroke of 20 in.

The main engines are placed 8 ft.



MIDSHIP SECTION OF THE STEAMER THOUSAND ISLANDER

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apart in a single engine room without a center line bulkhead, the starting platform being very conveniently located between the engines, with ample space for the engine crew to work in. The cylinders are fitted with safety valves in the bottom and covers. From the center of the engines to the center of propeller is 62 ft. 6 in.

The cranks are set at 90 degrees. The high-pressure cylinder has one piston valve 9 in. in dia. while the low pressure cylinder has a flat, double ported slide valve 28 in. wide and 24 in. long. The valve travel in each case being 4¼ in.

The valves are operated by Stephenson's link motion through overhung bar links, whose motion is derived from eccentrics keyed to the crank shaft. The valve gear is so adjusted that the mean cut off in full gear will be about 66¾ per cent in the high pressure cylinder and 56¼ per cent in the low pressure cylinder. The point of cut-off will be variable by means of slotted reverse arms. The pins on the links for the attachment of the eccentric rods are 24¼ in. center to center, the full throw of the links being 12 in.

The high-pressure eccentric sheaves are of cast iron and made in one piece, while the low-pressure sheaves are made in halves. The straps for all the eccentrics are of cast iron and made in halves, the bearing surface in each being 2¼ in. wide. The distance from the center of the shaft to the center of the links is 50½ in.

The valve stems in all cases are 1½ inches in dia. through the valves, 2 in. in dia. through the stuffing boxes and 2¼ in. at the guides. The piston rods are each 3¼ in. dia. The framing of each engine consists of two cast iron I section columns at the front and two cast iron box section columns at the back.

Bed Plates of Cast Iron

The bed plates are of cast iron and contain three bearings each. The exhaust passage from the high to the low pressure cylinder is formed by an 8 in. extra heavy steel pipe, bent to the arc of a circle and connected by means of flanges to the upper facing of the steam chests, as illustrated in the general arrangement of the engine.

From the inboard side of each low-pressure steam chest a steel exhaust pipe leads to a cast iron fitting bolted directly to the condenser, which is common for both engines. Each exhaust pipe has a diameter of 11 in. at the cylinder and 12 in. at the condenser.

The high-pressure pistons are of cast iron fitted with cast iron plugs arranged for water grooves. The low-pressure pistons are of cast steel fitted with the usual arrangement of cast iron follower and two spring rings in each piston. All pistons have a depth of 4½ in.

The crossheads are of cast steel with pins 4 in. dia. by 5½ in. long. Brass slippers are fitted for both ahead and astern thrusts. The slipper for the ahead thrust is 10 in. wide by 12 in. long, while the combined width of the slippers for the astern thrust is 6 in. with a length of 12 in.

The crosshead backing guides of L section are made of cast iron and bolted directly to the back columns.

The connecting rods, which are 45 in. center to center, have a diameter at the crosshead end of 3¼ in. and 3¾ in. at the crank end. The crosshead end has a single connection, and the adjustment for wear at that end is taken up by means of a wedge, while at the crank end a bolt connection is used.

The crank shafts are each made in one forging with a coupling disc 14½ in. dia. x 1⅞ in. thick at one end. The length over all is 7 ft. 2½ in. The journals are 6¾ in. dia. while the crank pins are 6¾ in. dia. by 8 in. long.

Details of Shafts

The crank webs are 7¾ in. wide by 4¾ in. thick. Opposite each crank slab a tail piece is forged, to which the cast iron counter-balances are bolted. The counter-balances are of sufficient weight to take care of the reciprocating as well as the rotating weights. Each thrust shaft is 6¾ in. dia. and 3 ft. 7 in. over all, being fitted with four collars 13 in. dia. by 1⅜ in. thick and 3½ in. apart. A coupling disc is forged on each end 14½ in. dia. by 1⅞ in. thick.

There are two intermediate shafts for each engine, 6¾ in. dia. by 12 ft. 9¼ in. long and coupling discs forged at each end. The tail shaft is 7¼ in. dia. in the bearings and 6¾ in. dia. between the bearings and at the ends. Length over all is 30 ft. 3 5/16 in. A cast iron coupling disc 18¾ in. dia. is shrunk on the forward end.

Each crank shaft has three bearings 6¾ in. dia., two being 8 in. long and one 11¾ in. The thrust bearings consist of cast iron pedestals fitted with three cast iron horse shoe collars lined with white metal in each pedestal.

The intermediate shafting for each engine will be carried by two spring bearings made of cast iron, the lower halves being lined with white metal.

Each propeller shaft will be supported at the outboard strut and also in the stern tube by a bearing at each end. The bearing in the strut will consist of a brass sleeve 22 in. long carrying wood strips of lignum vitae. The after bearing in the stern tube is a duplicate of the strut bearing, while the bearing at the inboard end consists of a brass sleeve.

The stern tube is made of two cast iron sleeves connected by a standard steel pipe 9 in. dia. The after sleeve is made to fit a cast steel boss riveted to the shell of the ship while the inboard end is flanged to receive the after collision bulkhead. The over all length of stern tube is 14 ft. and 5 in. There are two propellers of cast iron, solid, three bladed, and made to the right and left hand. The diameter of each wheel is 6 ft., while the pitch is 9 ft. The developed area for one wheel is 14½ sq. ft. The propellers rotate outboard.

Boilers

Two single ended Scotch boilers of the cylindrical type working at a pressure of 150 lbs. to the square inch are located on the center line of the ship in one boiler room. The distance apart of the boilers longitudinally is 9 ft. 9 in. between the furnace fronts, while each boiler has a separate funnel spaced 12 ft. apart. The funnels are 40 in. inside dia., while the outside stack is 48 in. dia., the top being 40 ft. 3 in. above the grates. The boiler aft projects through the bulkhead between the boilers and engines about 3 in. There is an exit to the main deck at the forward end of the boiler room. Ventilation for the boiler room is provided by two 24 in. ventilators placed in the center of the boiler room and whose outlets are carried down to a height level with the bottom of the air heater.

The furnaces, two in each boiler, have internal and maximum diameters of 45 in. and 48 15/16 in. respectively, the thickness being 15/32 in. The grates are 5 ft. 6 in. long, the grate surface of each boiler being 41¼ sq. ft., while the heating surface in each boiler is 1,713 sq. ft., or a ratio of 41.5 to 1; making for the two boilers an aggregate grate surface of 82.5 sq. ft. and a total heating surface of 3,426 sq. ft. The furnaces are of the Morrison suspension type and have independent combustion chambers. The length of the tubes between the tube sheets is 6 ft. 10 3/16 in. and they are spaced 3½ in. in a vertical and 3¾ in. in a horizontal direction. Each boiler contains 326 tubes, of which 44 are stay tubes; all have an outside diameter of 2½ in. with a thickness of No. 10 for the stay tubes

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"O" Metropolitan injector discharges into the after end of this manifold.

There is one 4 x 3¼ x 5 independent, duplex, piston, horizontal fresh water pump placed on the starboard side of the ship on the forward engine room bulkhead. The suction and discharge are, respectively, 2 in. and 1½ in. The suction and discharge are connected to the fresh water tanks, which are placed in the boiler room.

There is one 5½ x 5 x 5 independent, duplex, piston, horizontal sanitary pump placed on the starboard side of the ship and whose suction is taken from the sea. The suction and discharge are, respectively, 3 in. and 2 in.

There are two dependent, horizontal, plunger bilge pumps, 4½ in. diameter by 4-in. stroke, each pump deriving its motion from a pin driven into the forward end of the crank shaft. The pump body is bolted to the outboard side of the bed plate of each engine, the suction, 3 in. diameter, is connected to the bilge, while the water is discharged through 2½-in. pipes directly overboard.

There is a double-cylinder 5 x 5½ steering engine, steam and hand combined, made by the Hyde Windlass Co., Bath, Me., and placed on the port side of the ship, connecting with the rudder quadrant by means of chains.

Electrical Equipment

There is a 25-kilowatt Crocker-Wheeler generator direct-connected to a Terry steam turbine, which furnishes current for lighting the ship. This outfit is placed on the main deck, starboard side, just aft the engine platform. The switchboard is placed on the port side near the entrance to the engine platform, the whole being within the engine well.

The ash gun is placed at the starboard side of the ship on the forward side of the coal bunker bulkhead. The gun consists of the hopper into which the ashes are thrown and there discharged overboard through a 7-in. extra heavy pipe, check valve and deflector, which is riveted to the side of the ship. A water jet at the top and bottom of the gun furnishes the necessary power to discharge the ashes.

There is one vertical, duplex, plunger hand pump, required by the United States laws, placed on the main deck, aft. Each cylinder is 4¾ in. diameter with a stroke of 6 in., making a total capacity for each cylinder 106 cu. in.

The Thousand Islander carries life saving equipment for 1,000 passengers.

The Monitor Type of Vessel

By Arthur H. Haver

The special feature of the "Monitor" type of vessel is the application of two corrugations on the outside of the ship.

They are in the form of two horizontal projections between the load waterline and the bilge, and extend along the main portion of the vessel until they merge into the ordinary form of ship's ends.

Their effect in a way is to subdue the waves, making a more seakindly vessel. When the ship rolls the amplitude of the roll is reduced, whilst the period of roll is increased. This action is also felt in the fore-and-aft pitching and 'scending.

The form of the corrugations, whilst adding to the displacement and wetted areas, has the important effect upon the ship that it requires less expenditure of horsepower and coal consumption to propel her at a given speed when compared to a plain vessel of identical dimension, form and fineness. The corrugated form of the shell has considerably more inertia and strength, so that the stiffness is enormously increased in every direction, lateral, vertical or horizontal. Vibration is, therefore, practically unknown in all weather. Unlike plain ships of any type or form, this side increases in strength as she heels over, and when carrying different cargoes, such as iron ore, the easy action is marked and rendered as comfortable as ordinary vessels with ordinary cargoes, the action of the corrugation reducing the roll in the same manner as bilge keels.

The strong form of side, giving greater ability to resist crushing strains or blows from impact, makes a firmer, truer and more rigid side, so that the thickness of shell need not be so great and the supporting frames need not be so numerous.

Two vessels have been built and are satisfactorily working, whilst three others are building.

From the experience gained, extending over two and three-quarter years, it has been proved conclusively, and is now admitted by the profession, that this type of vessel can economize 16 per cent of coal and horsepower, whilst carrying about 3 per cent more displacement, which is equivalent to 20 per cent reduction as compared with ordinary vessels of the same dimensions, form and fineness, and with the same propeller and engines.

The size of the two vessels built, the Monitoria and Hyltonia, is 279 ft. by 42 ft. by 20 ft., 7½ in., 18 ft. draught, and, instead of requiring about 780 i. h. p. for 8¾ to 9 knots, they are propelled, although carrying 100 tons more displacement, with only 630 to 650 i. h. p., which means a saving in coal per day of between two and three tons.

This economy of working admits of the vessel carrying extra remunerative cargo by the amount of the saving in the cost and the weight of coal not put on board, so that on a round voyage the cargo on which freight is paid is something like 6 per cent in excess of that of a similar plain ship.

Finally, there is not a vessel on the market, patent or otherwise, but is capable of being further improved by the application of corrugations, in making a stronger, more economical and better seagoing vessel. When the designers of a plain-sided vessel have exercised all that ingenuity and skill can suggest to make her a perfect vessel, it is still possible by adding these corrugations further to improve her.

The greatest obstacle the pioneers of this type have met with is the conservatism of many who think these facts are impossible of attainment, because the prevailing theories fail to account for them. Yet those who have closely inquired into the improvement have, without exception, been convinced of its truth and accuracy, and that it is in no way opposed to true theory.

It is announced that the Cunard Line has decided to appoint a "staff captain" for the express liners Mauretania and Lusitania. The duty of the staff captain will be to maintain discipline, conduct boat drills and have the management of the crew under his direction. This officer will also assume full charge at any time that the captain may be ill or exhausted. This move is in the direction of greater safety, as with greater ships comes greater responsibility, and it is presumed that the staff captain will be of equal ability to the captain of the ship.

The steamer Forest City, which formerly ran between Cleveland and Port Stanley, has been transferred to Lake Superior and will run between Fort William and Isle Royale, being operated by the Lake Coast Trading Co.

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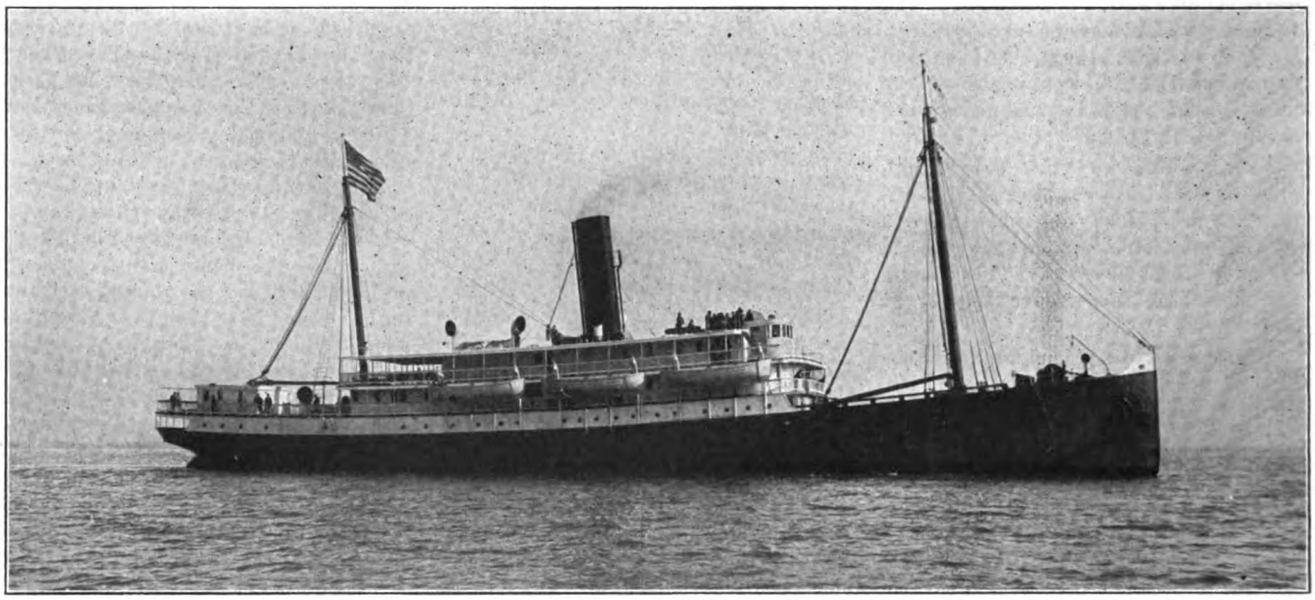
Dahl Oil Burning System

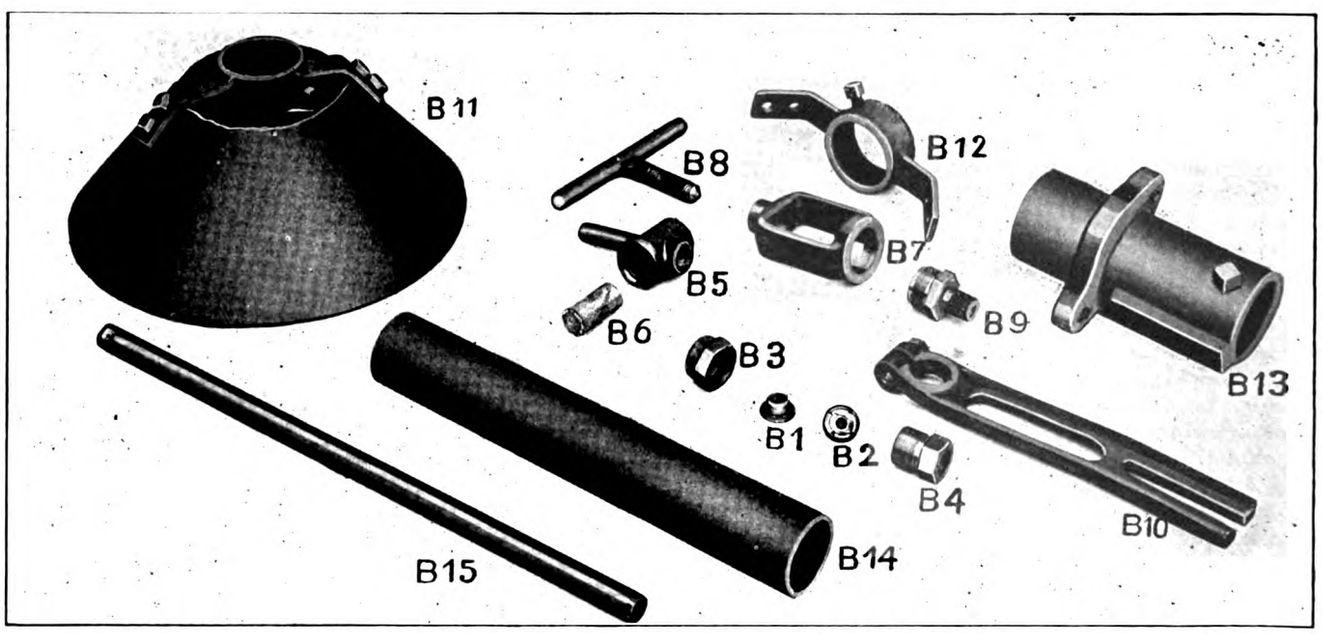
Description of a System Which the Union Iron Works Has Installed on a Number of Pacific Coast Vessels



STEAMER KILAUEA, FITTED WITH DAHL OIL BURNERS

LIQUID fuel generally used in firing of boilers is the crude petroleum, ranging in density from 10 to 20 per cent baume. To burn crude oil in a mechanical oil burning system it is necessary to heat it to a degree near its flash point and by means of pumps force it through some mechanical contrivance in order to break it up into small particles, when it is ready to ignite and form a constant, iridescent flame, resulting in complete combustion.

The mechanical perfection of the apparatus used in delivering the oil to the furnace is the most important factor in oil burning. Nearly all oil burning systems have had the same requisite parts as the Union Iron Works mechanical oil burning system, that is to say pumps, heaters, strainers, piping, valves and burners, but in addition it is generally customary to use some foreign agent to atomize the oil, such as compressed air or live steam. It is true there are a number of mechanical oil burning systems on the market which have been more or less successful with the lighter oils, but which have not been satisfactory where only the heavier oils



ONE COMPLETE OIL BURNER SET—B1, TIP; B2, ATOMIZER; B3, ATOMIZER NUT; B4, CLAMPING NUT; B5, STRAINER SLEEVE; B6, STRAINER; B7, YOKE; B8, HANDLE; B9, NIPPLE; B10, BRACKET; B11-A, REGULATING CONE; B11-B, REGULATING CONE; B12-A, CASTING FOR CONE; B12-B, CASTING FOR CONE; B13, NOZZLE; B14, ADJUSTING PIPE FOR CONE; B15, BURNER PIPE

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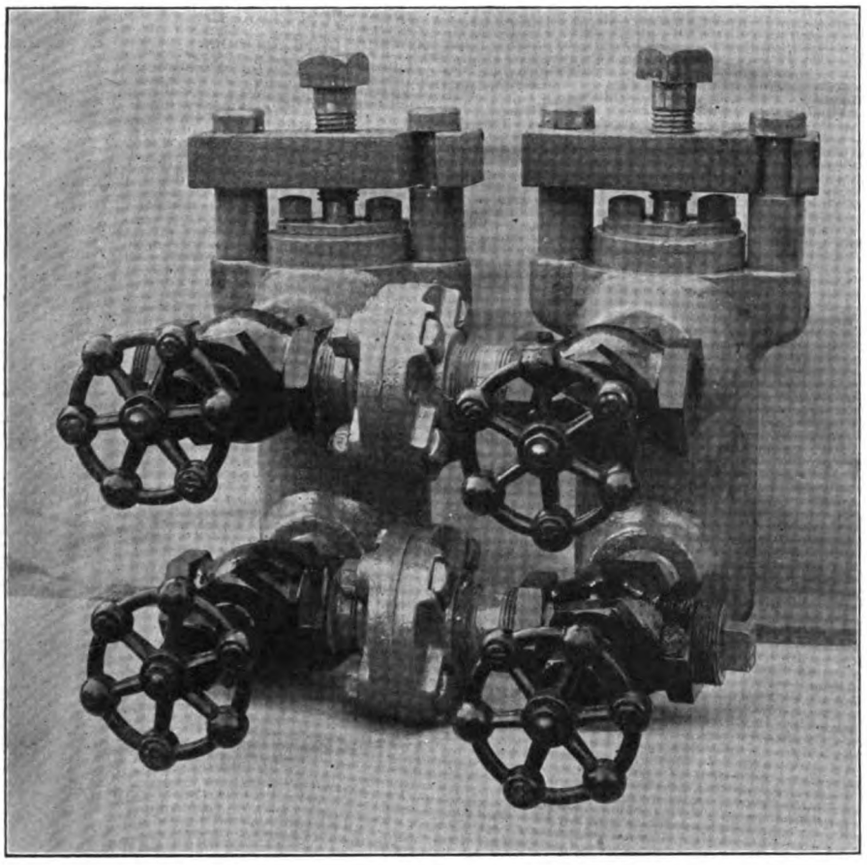


UNION IRON WORKS' AIR COMBINED DISCHARGE STRAINERS

could be readily obtained.

The use of air and steam has been eliminated in the Union Iron Works mechanical oil burning system, doing away in the first place with large compressors with their piping, etc., which occupy much valuable space in vessels; and in the second place abolishing the use of live steam. On most vessels, this latter is a very serious item. The steam used for atomizing (which usually amounts to from 3 to 5 per cent of all steam generated), and this water being blown up the stack renders it necessary to either carry a large amount of water or to install an evaporator to make up the loss. In a stationary plant where water has to be purchased by meter or where water is very difficult to obtain, it can readily be seen that a practical mechanical oil burning system is of great advantage.

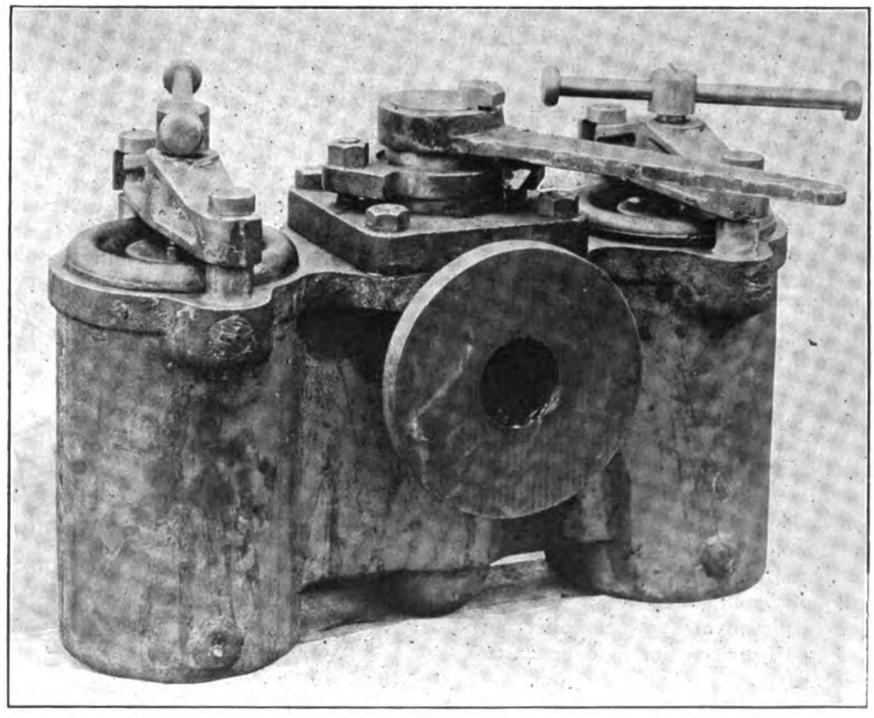
The burner is simple and has few parts. It has no moving parts at all to clog and get out of order and is well protected by strainers should any foreign matter get to the tips. In the suction to the pumps are the duplex strainers that take care of the large particles that may be in the oil, thus protecting the pumps. In the discharge from pumps to the heaters are the duplex discharge strainers that protect the heaters and before the oil enters the burners it passes through still another fine strainer to protect the tip from clogging.

The Dahl Mechanical Burner

The precautions taken to cleanse the oil of any foreign matter insure longer running without examination. The Union Iron Works' burner has been run for thirty-six hours under the most adverse conditions without the tips becoming clogged in any way or requiring to be cleaned.

The oil burning systems of the past have used a great variety of burners, which have necessitated an atomizing agent, such as air or steam, which, in turn, in the case of air atomization, meant the installation of an air compressor, or with steam atomization an evaporator of sufficient size to make up the deficiency in the feed water. This meant quite an expenditure, not alone in first cost, but in maintenance and repairs. It was discovered that by heating the oil to a high temperature and forcing it through a suitable burner tip under pressure, it could be perfectly atomized. The Union Iron Works experimented for some time on such a burner, and has at last produced one which is covered by the Dahl patents.

By a mechanical oil burning system is meant a system that requires neither steam nor air for atomizing the oil. The oil, after being heated to the proper temperature, is forced through the burner at the required pressure, the passages in the burner being such that the oil is thoroughly broken up before being discharged, so that it immediately volatilizes, and a perfect flame is obtained as soon as the oil leaves the burner. The pressure under which the oil is forced through the burner and the size of the tip regulate to a nicety the exact amount of oil that can be burned. The quantity of oil can be varied to some extent by



UNION IRON WORKS CO.'S COMBINATION SUCTION STRAINERS

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the pressure, and more by the size of the tip used in the burner.

The furnace front is of approved construction and so arranged that the burner passes through a pipe, on the end of which is a cone or deflector, which can be adjusted by moving it in or out to secure the proper quantity of air just where it is needed. The front is extended, so that the whole length of the furnace is utilized, and the brickwork is so fitted that repairs and examinations can be made without removing it.

In the case of boilers already having extended fronts similar to those used with the Howden system very little change is necessary to adapt them for receiving the new system.

The pressure of the oil can be varied from 30 lbs. to 200 lbs. to the square inch, and the temperature may be varied from 150 degrees F. to 260 degrees F.

Simplicity of the System

The system consists primarily of a pump, heater and burner, although in practice two pumps and two heaters are fitted, so that in case of a breakdown, or in case of overflow there will always be one pump and one heater in reserve.

Every care has been taken to make the system as simple and as nearly "fool-proof" as possible. In addition to the advantages claimed in ordinary practice, the system is absolutely noiseless, and therefore has this recommendation for its adoption on passenger steamers, ferry-boats and steam whalers.

The Union Iron Works Co. has protected its invention in all parts of the world and is now able to publish some of the data obtained on the first vessels that have been fitted with their system.

Leading marine engineers, whose opinions on technical questions are highly valued, say that the oil-burning system as fitted by the Union Iron Works Co. marks one of the most important steps in solving the problem of fuel for ocean-going steamers.

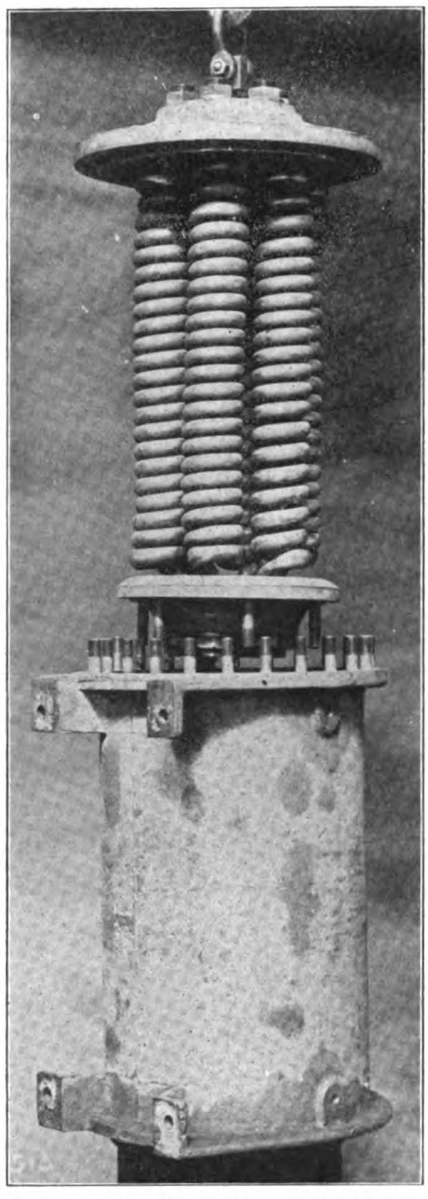
The system is just as efficient in melting or heating furnaces, stationary boilers, or, in fact, anywhere where fuel is burned in a furnace.

All parts of the system have undergone a gradual development and where a slight defect has been discovered it has been rectified, or where improvement could be made it has been done in order to make the system as complete and efficient as possible.

The Union Iron Works system, although comparatively new, is now operating plants with a collective indicated horse power of over 200,000.

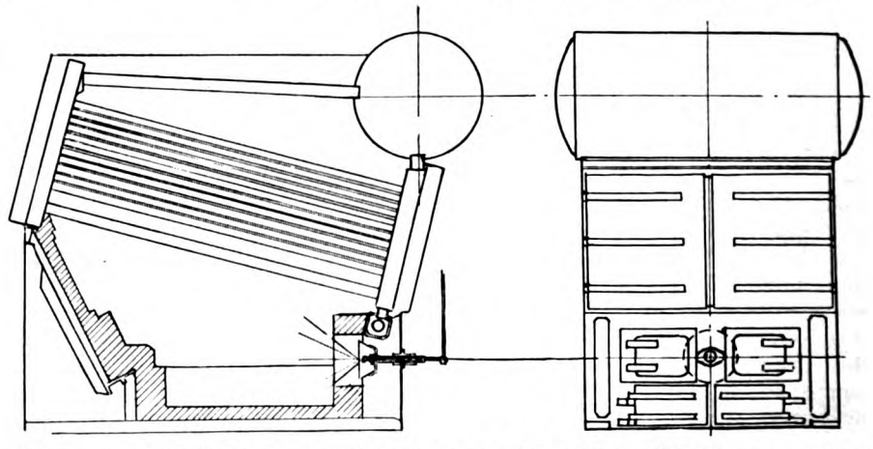
Method of Operation

The Union Iron Works Co. has issued the following instructions as to the method of operating mechanical oil burners:



REMOVING COIL, NO. 6 HEATER

Inspect the entire system, especially the strainers. See that the baskets are clean and in place. With burner valves closed and the valve at the end of the oil line open, start the pump slowly to allow the oil to circulate back to the suction line. Open steam to heater and drain same. Close the drain on heater until it is just open enough to allow the condensed water to escape to tank and regulate the steam valve to keep the temperature steady. When the thermometer registers 180° to 200°, close the oil valve at the end of the line and open the valve on the burner. The pressure gage on the line should register 30 lbs. or above, and with a lighted torch under the burner the oil will ignite. Push the regulating cone as far in the furnace as possible and then gradually withdraw same until the edge of it clears the flame. Do the same with all furnaces. Keep the temperature of the oil as near as possible at 220°. The pressure on the oil pump should be about 60 lbs., and should the fires not be large enough increase the pressure to 200 lbs., but do not exceed that. It is of great importance that the burners be kept clean as the passages are very small, and a dirty burner causes smoke and a deposit of carbon in the furnace. Whenever the carbon appears in the furnace, change the burner and break off the carbon from the sides of the furnace with a small bar through the lighting hole, and with a clean burner working properly it will burn up. Whenever a fire is burning one-sided, sparking on one side, or showing black streaks, it is a sign that the burner needs cleaning. It is well to have a can of coal oil in the fireroom in which the tip, atomizer or strainers may be washed before returning to their place. When a new system is installed, it should be thoroughly blown out with steam before allowing the oil to enter the pipes. In making the joints, there is always a certain amount of dirt and grit which gets into the pipes, and this should be entirely gotten rid of before lighting the



ARRANGEMENT OF FURNACE AND BRICKWORK FOR BABCOCK & WILCOX WATER TUBE BOILER (MARINE TYPE)

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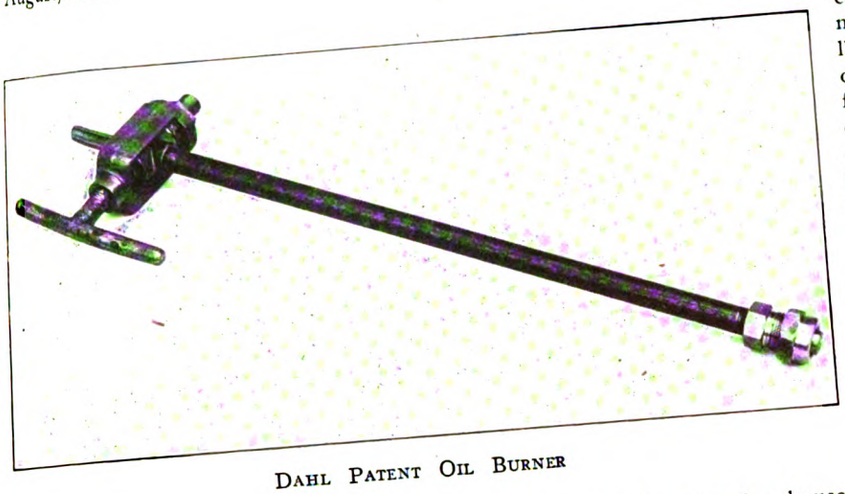

DAHL PATENT OIL BURNER

fires. If the oil is allowed to get too hot, over 200 F., gas will accumulate in the oil line causing the fires to burn unsteady and flicker. To overcome this, open the valve at the end of the oil line slightly for a few seconds to allow the oil to circulate back to the suction and allow the gas to escape.

The table accompanying this article shows the marine installations which the Union Iron Works Co. has made of the Dahl system during 1911 and 1912.

Dredger for Burma

Wm. Simons & Co., Renfrew, launched from their yard last month the dredger Campbell, built to the order of the Indian government for the improvement of the waterways in Burma. This dredger, which is of the "Simons" suction reclamation type, has been specially designed and constructed under the direction of Prof. J. H. Biles, naval architect and consulting engineer to the India office. The Campbell is a twin-screw light-draught cutter dredger and will work in conjunction with a floating pipe line and terminal pontoon, arranged for delivering dredged material over river or canal banks for land reclamation.

The dredging pump is driven by an independent set of triple-expansion engines and the suction pipe is carried on a frame fitted in well at forward part of vessel. The lower end of suction frame is fitted with a steel spiral rotary cutter, driven by cast steel machine cut gearing from a set of horizontal compound engines placed on deck. The gearing and cutter are of ample strength to stall the engines when working at full power. Independent steam hoist gear is provided for controlling the suction frame, and very powerful manuevering winches are placed at each end of the vessel. An operating house is provided on upper deck containing all necessary levers and telegraphs to enable one man to have complete control of the dredging operations. The dredger is propelled by twin screws, each driven by a set of triple-expansion engines. Steam is supplied by two cylindrical multitubular boilers, constructed to Lloyds requirements for a working pressure of 160 lb. The boilers are fitted with Howden's forced draft for burning Indian fuel. A complete installation of condensing plant capable of dealing with exhaust steam from all the engines in the vessel at one time, independent automatic feed pumps, bilge pumps, service pumps, pressure pumps, filters and all the other usual auxiliaries for a vessel of this tye, are provided in engine room. A repair shop with electrically-driven machine tools capable of overtaking minor repairs, is fitted on board. Electric light installation is provided both above and below deck. The vessel is provided with every accommodation necessary for a crew working in a hot climate.

The contract for converting the six-masted steel schooner William L. Douglass, which was sold recently by the Coastwise Transportation Co. to the Sun Co., Philadelphia, into an oil-carrying barge, has been awarded to Cramps, Philadelphia.

STEAMERS FITTED WITH OIL BURNING SYSTEM

Name.	No. Boilers.	No. Furnaces.	Total H. P.	Size of Engine.
Maverick	2	6	1,300	25"-41"-67"x51"
City of Para	6	12	1,700	28"-44"-70"x48"
Pennsylvania	2	8	1,200	22"-36¼"-60"x36"
Aztec	2	6	1,400	24"-40"-66"x45"
Barge No. 95	1	2	.....	.....
Leelanaw	2	6	800	22"-35"-58"x42"
Pectan	6	18	2,800	29½"-48"-78"x54"
Oleum	3	9	2,300	18"-28"-45"x30" (T.S.)
Kilauea	4	12	2 600	25"-41"-48"-48"x30"
Mauna Loa	2	4	1.000	15½"-26"-43"x33"
Sonoma	8	24	8.000	28"-46"-75"x48" (T.S.)
Ventura	8	24	8,000	28"-46"-75"x48" (T.S.)
Union Tug	1	1	75	9"-17"x12"
Prince George	4	18	6,000	23½"-37"-41"-41"x33" (T.S.)
Prince Rupert	4	18	6,000	23½"-37"-41"-41"x33" (T.S.)
Yukon	2	4	800	.....
Venetia	2	4	800	16"-22"-42"x25¾"
Buckman	3	6	1,500	22¾"-37⅞"-63"x40"
Watson	3	6	1,500	22¾"-37⅞"-63"x40"
Princess Beatrice	2	6	1,400	18½"-30"-50"x36"
Al-Ki	2	4	800	22¾"-44"x36"
Baramba	2	2	600	Locomotive boiler.
Wilhelmina	6	24	7,000	35"-58"-69"-69"x60"
Britannia	1	2	300	10"-16"-25½"x16"
Rose City	6	12	1,900	28"-44"-70"x48"
Bear	6	18	3.700	31"-50"-84"x54"
Beaver	6	18	3,700	31"-50"-84"x54"
Princess Adelaide	4	12	5,000	.....
Asuncion	2	6	1,400	B. & W. boilers.
Pacific	2	4	250	Risdon W. T.
California	2	6	3,000	.....
Wilson Lumber Co.	2	6	.....	Scotch boilers.
Caledonia Dredge	2	2	600	Springfield dryback boilers.
Dredge	3	6	1.434	Parker boilers.
S. S. Atlas	2	3	1,700	21⅝"-34"-56"x42"
Dan E. Erickson	1	3	400	Scotch boilers.
Barge No. 91	1	2	300	Scotch boilers.
Olsen Mahoney No. 3	2	6	1,700	.....
Union Freight Steamer	2	6	.....	.....
S. S. Ashtabula	4	12	3,000	28¾"-46½"-77"x54"
S. S. Princess Victoria	6	18	6 000	.....
Whaler Kodiak	1	2	400	.....
Whaler Unimak	1	2	400	.....
S. S. Grace Dollar	1	2	350	10½"-18"-30"x24"
S. S. Capt. A. F. Lucas	2	8	2,550	25"-41½"-68"x42"
S. S. Arrow	1	1	.....	.....
Tug Point Grey	1	3	700	.....
S. S. Princess Patricia	One O. E.	8	4,000	Parsons steam turbine.
S. S. Jefferson	3	9	1,400	.....
S. S. El Segundo	2	8	2,200	Scotch boilers.
Sulphur Boat Freda	2	6	.....	Scotch boilers.
S. S. Chelohsin	2	6	1,600	.....
S. S. Princess Sophia	3	9	.....	.....
S. S. Col. E. L. Drake	2	8	2,350	25"-41½"-68"x42"
S. S. Richmond	3	9	3,100	23"-32¾"-49"-71½"x51"
S. S. Venture	2	6	1,500	Twin screw.
Gov. Tug	1	2	400	.....
S. S. Portland	2	4	1,000	Scotch boilers.
W. R. Grace & Co.	3	6	2,500	Scotch boilers, triple expansion engine.
S. S. Princess May	.	..	.....	.....

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Ice Breaking Tug James Whalen

The ice-breaking tug James Whalen which was constructed by the Bertram Engine Works, Toronto, has attracted more or less attention since she went into commission in 1905. Her leading dimensions are: Length over all, 108 ft.; length between perpendiculars, 98 ft.; breadth molded, 24 ft.; depth at side, 14 ft. 5 in.; mean draught light, 10 ft.; mean draught with water ballast, 13 ft.; gross registered tonnage, 313.4; net registered tonnage, 156.26.

The Whalen is built of steel throughout with water ballast forward and aft, her shell plating being double for half her length from stem. The frame spacing is 24 in. to within 14 ft. of stem, the forepeak being 15 in. and the balance 18 in.

She is equipped with fore and aft compound engines, 20 and 40 in. cylinder diameters x 36-in. stroke, supplied with steam from Scotch boilers, 12 ft. 6 in. diameter and 12 ft. long, allowed 156 lbs. pressure. Her bunkers have a capacity for 100 tons of coal. She has four pumps, 8, 5 x 12; 6, 3½ x 7; 6, 4 x 7, and 4½, 2½ x 4. Her towing machine is 14 in. x 16 in. She is equipped with a 5 k. w. electric plant, steam steerer, searchlight and gasoline launch.

During the winter of 1912, she broke ice 57 in. thick at the dry dock at Port Arthur. She keeps the harbor of Port Arthur and Fort William open, as well as a channel 25 miles long to open water all winter. The Whalen carries a crew of eleven men with accommodations for as many more. She has a passenger license. During the season of navigation she works in conjunction with three large wrecking barges equipped with wireless and two 20-ton derricks on each, as well as a full line of wrecking pumps and air compressors. These barges are capable of carrying 1,500 tons. The whole wrecking outfit can be got in readiness for work on an hour's notice.

TUG JAMES WHALEN BREAKING 4 FT. OF ICE

Decade's Wastage of Steel Vessels

During the past ten years, 29 iron and steel vessels have become total losses on the great lakes. These vessels include the iron steamers Clarion and Russia, and the British-built steamers Turret Cape, Theano, Bannockburn, and the Canadian - built steamer Ottawa.

Of course, there have been total constructive losses of steel vessels as well, notably the steamer E. L. Fisher, which was sunk in Detroit river, but as these have been raised, repaired and placed in commission again, no attention has been paid to them.

It will be observed that the loss of steel tonnage, considering the number of ships and the volume of freight moved during these years, was not large. Some of the losses, of course, were unavoidable, as for instance those which were swept on the north shore of Lake Superior, during the great storm of 1905. It must be admitted, however, that some of them were avoidable and would not have occurred at all, had the rules of navigation been carefully observed.

Five of the losses have elements of mystery about them which will never be solved. No one knows what happened to the Bannockburn in 1902, the Cyprus in 1907, the Clemson in 1908, the car ferry Marquette & Bessemer No. 2, in 1909, and the car ferry Pere Marquette 18, in 1910. No one came ashore from the Bannockburn, the Clemson or Marquette & Bessemer No. 2 to tell the tale. One man came ashore from the Cyprus, but gave no responsible reason why this steamer should have foundered in a sea that was not disturbing much smaller craft. But the greatest mystery of all was the foundering of the car ferry Pere Marquette 18, in which 32 members of the crew were actually saved and not one of them knew what had happened.

Following is the table:

	Name of Vessel.	Carrying capacity, gross tons.
1911—Str.	Joliet	2,777
Str.	John Mitchell	7,500
Str.	Turret Cape	3,100
1910—Str.	Frank H. Goodyear	6,900
Str.	W. C. Moreland	12,000
Str.	John Sharples	2,800
Car	Ferry Pere Marquette No. 18	5,090
		Carrying capacity, gross tons.
1909—Str.	Aurania	4,500
Str.	Clarion	3,000
Str.	John B. Cowle	6,500
Str.	Ottawa	3,500
Str.	Russia	2,800
Car	Ferry Marquette & Bessemer No. 2	.....
		Carrying capacity, gross tons.
1908—Str.	D. M. Clemson	7,800
Pkg.	Frt. North Star	3,000
1907—Str.	Cyprus	7,300
1906—Str.	Grecian	3,255
Str.	Theano	2,600
1905—Str.	Sevona	4,500
Str.	Etruria	6,250
Str.	Thos. W. Palmer	3,100
Str.	Lafayette	6,588
Sch.	Madeira	7,000
Str.	Vega	3,272
Str.	Ira H. Owen	2,900
1904—None.		
1903—Str.	Queen of the West	1,500
1902—Whaleback barge	129	2,500
Str.	Bannockburn	3,000

The John Rohan Boiler Works Co., of St. Louis, are building a sand dredger for L. H. Yourtee, of Chester, Ill., 100 ft. long, 20 ft. beam and 4 ft. 6 in. deep.

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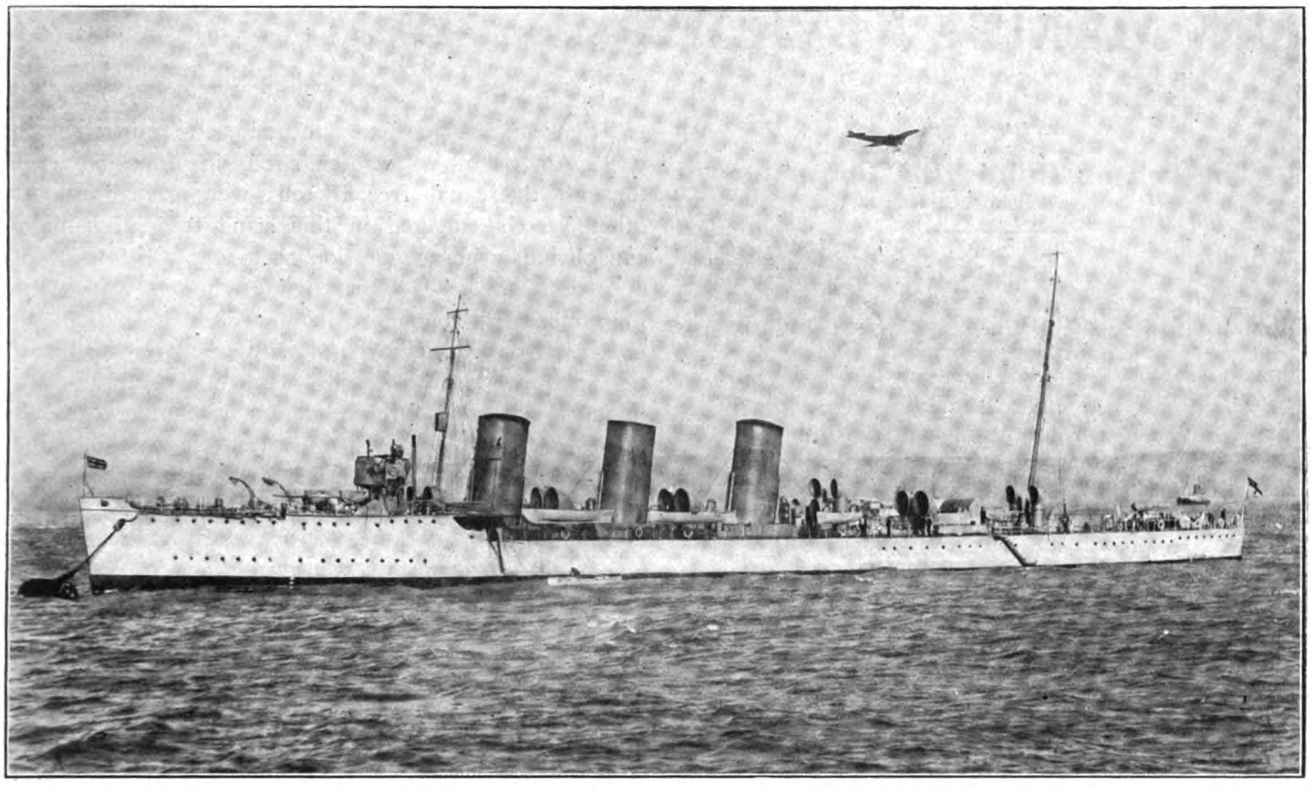

A REMARKABLE PHOTOGRAPH OF A MONOPLANE FLYING OVER THE BRITISH TORPEDO DESTROYER SWIFT AT SPITHEAD—THE SWIFT IS THE LARGEST AND FASTEST DESTROYER IN THE WORLD

ning tower and the wireless telegraphy apparatus. The dynamo in this case is driven by an internal-combustion engine, so that its working is secure even in the event of the flooding of the boilers, in the stokeholds. For the convenience of the passengers an electric bell installation is fitted.

Precautions Against Fire

In order to afford security in case of fire, there is a fire station, and a recording apparatus on the Rich system on the bridge announces the outbreak of fire, and through its telltale tubes from each hold or compartment steam can be forced to extinguish the fire at the moment of outbreak. Moreover, water extinction is provided for throughout the ship with a large number of fire hydrants. On the passenger decks iron fireproof doors are provided in considerable numbers, to prevent fire passing from one division to another.

Complete ventilation is provided for in all state and public rooms. There are for this purpose about 80 "Sirocco" ventilators, of a total of about 19,000 cu. m. capacity. The rooms of the fourth class are provided with thermo-tanks for ventilation and heating. In addition there is an abundance of natural ventilation. An ozone installation is introduced to sweeten the air of the rooms. To avoid rolling in heavy seas, which happens with so many ships, Fram's anti-rolling tanks have been installed.

In order to give an idea of the enormous quantities of the various materials utilized in such a ship, it may be noted that there have been used about 26,000 tons of steel plates, angles, profiles, etc.; 1,400 tons of nuts and screws; 600 tons of cast iron and cast steel; about 6,000 cu. m. of various woods. The weight of the complete sternposts, together with the shaft brackets, is about 175 tons, while the rudder weighs about 90 tons.

Four four-bladed propellers drive the ship, the diameter being about 16½ ft., worked by a turbine installation at a normal rate of 185 revolutions per minute. The individual turbines are arranged so that the steam passes through the high-pressure turbine on one inner shaft, to an intermediate pressure turbine on the other inner shaft, and finally thence to both low-pressure turbines on the outer shafts. Each separate shaft is capable of being worked and maneuvered independently. The reversing turbines consist of two high-pressure and two low-pressure turbines, with the later again on the outer shaft. The largest low-pressure casing has a diameter of about 18 ft. and a length of about 24 ft. 7 in. Two condensers are arranged near to the low-pressure turbines. The water-circulating pumps, four in number, are arranged two each on one engine, which drives both or either. There are a large number of boilers in water-tight compartments, which provide the necessary steam at a pressure of 16 atmospheres.

The city of New York has leased the municipal dock at Thirty-third street, Brooklyn, to the Bush Terminal Co. The Terminal company is to pay the city 95 per cent of the gross receipts monthly, retaining 5 per cent for its service. The dock is to be open to all shipping on equal terms without discrimination, and it is expressly understood that a new line of steamers consigned to and managed by James W. Elwell & Co., a rival dock company, shall be accommodated at the pier.

The Erie Railroad Transit Line which has been heretofore managed as an adjunct of the Buffalo division of the railroad by the division superintendent, will hereafter be managed from the general offices, 50 Church street, New York. Charles S. Goldsborough has been appointed manager with J. C. Maclay as superintendent at Buffalo.

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August, 1912

Panama Canal Bill

During the past month congress has devoted considerable attention to the Panama canal bill, not steadily, but intermittently, as it has been taken up between discussion on various appropriation bills. Great Britain has meanwhile added somewhat to the interest in the situation by sending a note to the state department that the bill in certain of its provisions violates the Hay-Pauncefote treaty. The note apparently is nothing more than this, but it has created quite a furore.

It is unnecessary to recount here the history of the Panama canal. Everyone knows that it was constructed exclusively by the United States at its own expense and through property acquired by it through purchase. The total cost of the canal will be approximately $400,000,000, and it is the expectation that it will be open to traffic in September of next year. It would appear to the layman as though the United States had a greater right in this ditch than any other nation, but there are many who take an opposite view and some of the views are, to say the least, surprising. For instance, it is held that the United States government has not the right to pass American vessels engaged exclusively in coastwise commerce through the canal without the payment of tolls. Great Britain takes this view, and it is apparently shared by others on this side of the water. As the coastwise commerce of the United States is reserved exclusively to the American ship, it is not easy to see in what way other nations are concerned in the case of these domestic tolls. That would appear to be a matter exclusively for the United States government to decide. The right to regulate internal commerce would seem to be the fundamental right of each nation, but after reading all of the speeches delivered in congress with the various interpretations placed upon various phases by scores of speakers, one is inclined to become lost in a kind of fog.

There might be some question as to our right to pass American vessels engaged in foreign trade through the canal free if tolls were levied against other vessels engaged in this same trade, but there can obviously be no question as to our right to remit even those tolls. If Great Britain chooses to pay the tolls on British tonnage using the canal no nation can object. In fact, Spain has already declared its intention of doing this very thing. But our domestic commerce is a totally different thing. Whether we remit or do not remit the tolls on domestic shipping, the right to do either should be unchallenged.

Probably the greatest authority that we have in this country on transportation is Prof. Emory R. Johnson, who holds the chair of transportation and commerce in the University of Pennsylvania. He was a member of the Isthmian Canal Commission from 1899 to 1904, and last year made a special report on canal traffic and tolls at the request of President Taft. He recently prepared an article for the *North American Review*, in which he has estimated the shipping that would have passed through the canal in 1909-10, had the canal been open at the time. His calculations are given in the accompanying table. Analyzing the figures given in the table, Dr. Johnson says that only 11.4 per cent of the traffic passed from one coast of the United States to the other by Cape Horn, the Isthmus of Panama or the Isthmus of Tehuantepec, and that the trade of this country with foreign countries accounted for 32 per cent of the total. The commerce between Europe and the west coast of South America supplied 38 per cent of the traffic which might have used the canal, and the trade of Great Britain alone with the west coast of South America would have supplied one-sixth of the total traffic through the canal in 1910. As the canal will not be open until 1915, it is necessary to increase these figures by the growth in trade that is to be anticipated. Dr. Johnson arrives at the conclusion that in 1915 ships with a total net register of 10,900,000 tons should pass through the canal.

ESTIMATED SHIPPING THROUGH PANAMA CANAL

	Total Entrances and Clearances.
Europe, with Western South America	3,148,400
Western Central America and Pacific Mexico	199,502
Pacific United States, British Columbia and Hawaii	689,718
Pacific United States via Suez Canal	158,000
Oriental countries east of Singapore and Oceania	1,174,585
Eastern United States coast, with Western South America, Pacific Mexico and Hawaii	467,595
Pacific coast of United States, (via Cape Horn)	172,655
Pacific Coast of United States and Hawaii, (via American-Hawaiian S. S. Co.)	363,426
Oriental countries east of Singapore and Oceania	1,500,000
Panama traffic	418,490
Eastern Canada, with Alaska, Chile and Australia	35,658
Total	8,328,029

(1) Not separable into entrances and clearances.

In estimating the amount of traffic which will use the new waterway, Dr. Johnson says that there are two important factors outside of actual distance from

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the Isthmus of Panama to be considered. The first of these is the tolls; the second, the cost of coal on the Panama route as compared with other routes. Then he defined the traffic which is for geographical reasons likely to use the canal from that which has a choice between the Straits of Magellan, the Cape of Good Hope, the Suez canal and the Panama canal. He says:

The Panama route will have a monopoly of the traffic of Hawaii and of the west coast of North and South America, with the exception of a small part of the trade of Southern Chile, but it so happens that the marginal traffic for which the Panama canal must compete with other routes is of exceptionally large tonnage and value, comprising the major share of the commerce of Pacific Asia and of Australasia. The ships engaged in the trade of which the Panama route has a monopoly will comprise the larger share of the canal's tonnage, but the marginal traffic is a prize so well worth competing for that it should be given careful consideration in fixing the tolls to be charged at Panama. The volume of traffic and the commercial usefulness of the canal, as well as the revenue obtained from its operation, are dependent upon the transit dues.

Dr. Johnson thinks that a toll of $1.00 a ton will probably be sufficient to divert the commerce between Europe and the central districts of Chili to the Straits of Magellan were it not that vessels engaged in that trade would want the coast trade of South America on their way. Moreover, the Panama route would offer opportunities to buy coal so much more cheaply on the Isthmus or in the West Indies than on the east coast of South America that the difference in the price of fuel would probably be equal to one-half or even more than one-half of the canal tolls.

The canal, under any tolls it is likely to impose, will probably obtain the trade between the Atlantic coast of the United States and Australia and New Zealand, but for the European trade with Australasia the Panama canal will have serious competition from Suez for fast steamships, and from the Cape of Good Hope for ordinary freight vessels. If the Panama tolls are kept lower than those of Suez, some of this trade should be captured. Concerning the trade with the far east, Dr. Johnson says:

The Panama and Suez routes will be active rivals in the rich traffic field east and north of Singapore. The line connecting points equally distant from New York by way of the opposing routes runs through Hongkong and Manila. To the north and east of those cities the distance and time advantage is with the Panama route for trade of the eastern seaboard of the United States. To the south and west of Hongkong and Manila the Suez route will have the advantage. There will be some traffic from places north and east of Hongkong and Manila that will be taken to New York and the east coast of the United States by way of Suez. It is equally true that vessels will start from points west of Hongkong and Manila and proceed by way of Panama to New York. There will be an overlapping of routes between Singapore and Yokohama.

Dr. Johnson considers that any traffic between Europe and Japan, China, or the Philippines by way of the Panama canal will be attracted because the tolls are lower than those of the Suez canal or because of cheaper coal, and he suggests that the tolls of the new canal be adjusted to try to gain some of this trade. In 1910, there were 12,000,000 net tons of it and it would be a fine thing if the Panama canal could obtain say 20 per cent of this.

The question of coal is an important one and if it is commercially possible to deliver and sell coal at Panama cheaper than it can be procured at Suez, it should have much influence in diverting traffic to this route. Coal at the present time is selling at $6.00 per ton at Suez. He gives the illustration that a freight vessel of 3,000 tons net register made a round trip from New York to the Philippines via Suez, paying $20,868 for coal. Had the same vessel made the trip via Panama and San Francisco, the coal bill would have been $18,220, a saving of $2,648. Dr. Johnson estimates that the traffic on the canal will increase 60 per cent every decade. At that rate 17,000,000 tons net register will be using the canal in 1925. He approaches very guardedly the question of free passage for American vessels and the prohibition of the use of the canal to vessels owned by railroads and expresses no pronounced conviction on these subjects.

The Titanic Disaster

Lord Mersey has rendered his decision in the case of the Titanic. The most important findings of the court were that the Titanic was sufficiently and efficiently officered and manned and complied with all the regulations of the British merchant shipping act regarding safety, but that the arrangements for manning and launching the life boats in an emergency were insufficient and that no drill had been held. The track of the steamer was held to be reasonably safe for the time of the year, provided great caution and vigilance were used in crossing the ice region. In view of the fact, however, that on the night of the accident the moon was not shining and especially in view of the high speed at which the Titanic was steaming, an extra lookout should, in the court's opinion, have been placed in the stem of the boat and a sharp watch kept by the officers on both sides of the bridge.

The judgment does not consider binoculars necessary. Searchlights, however, might be serviceable, but the evidence submitted to the court was insufficient to permit of a precise answer. The court recommends that the Board of Trade investigate the practicability of providing seagoing ships in addition to their watertight transverse bulkheads with a double skin carried above the waterline, or with a longitudinal vertical watertight bulkhead on each side of the vessel, or with both; that it should investigate regarding the question of providing of watertight deck or decks stretching along the whole or part of the length of the ship at a convenient distance above the waterline, and should also investigate whether the opening should be watertight doors or some other device; that it should also report generally on the increasing protection given by the subdivision of the vessel with the object of keeping the ship afloat with the greatest proportion of her length in free communication with the sea.

It is suggested that an international convention be called to agree on a common rule for the subdivision of ships, life saving apparatus, wireless regulations, speed in the ice regions and the use of searchlights.

The court held that Capt. Smith's course in maintaining speed in the face of ice warnings was in accordance with long existing custom due to competition and to the desire of the public for quick passages, adding:

"In the circumstances I am unable to blame Capt. Smith. He had not the experience which his own misfortune afforded to those whom he left behind. Other skilled men would have done the same in the same position."

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Work in Coast Ship Yards

Coast Ship Yards Are Being Rapidly Filled With a Fine Program of Ship Building. Some of the Vessels Are for Foreign Account

Newport News Shipbuilding & Dry Dock Co., Newport News, Va.

Battleship Texas for the United States navy.

Fleet collier Proteus for the United States navy.

Fleet collier Nereus for the United States navy.

Freight and passenger steamer Lenape for the Clyde Steamship Co.

Lumber steamer Adeline Smith for the C. A. Smith Timber Co.

Car float for the Chesapeake & Ohio Railway Co.

Freight steamer P. H. Crowell, for Crowell & Thurlow Steamship Co.

Oil tanker for the Texas Steamship Co.

Freight steamer for New York & Porto Rico Steamship Co.

Ammunition lighter for United States navy.

Oil barge for the Southern Pacific Co.

Freight and passenger steamer for the Matson Navigation Co.

Oil tanker for East Coast Oil Co.

Bath Iron Works, Ltd., Bath, Me.

Torpedo boat destroyers Cassin and Cummings, for United States government.

Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.

Four passenger and freight steamships for W. R. Grace & Co., New York.

Six coal barges for the bureau of construction and repair, United States Navy.

Skinner Ship Building & Dry Dock Co., Baltimore, Md.

One steel oil barge, 153 ft. x 23.3 ft., for the Gulf Refining Co., New York.

One wooden derrick lighter, 80 x 23.9 x 7 ft.

Two wooden car floats, 224 ft. x 35 ft. x 8 ft., for Western Maryland Railroad Co.

Moore & Scott Iron Works Co., San Francisco, Cal.

Steel ferry boat for the Western Pacific Railway Co., San Francisco, Cal.

Staten Island Shipbuilding Co., Staten Island, N. Y.

Open deck lighter, for the New York Central Railway.

House lighter for New York Central Railway.

Tug boat, for Lehigh Valley Railroad.

Tug boat, for Texas Steamship Co.

Tug boat, for Hamburg American Line.

Torpedo float, for the United States navy.

New York Shipbuilding Co., Camden, N. J.

Battleship Arkansas, 98 per cent completed.

Battleship Moreno, 65 per cent completed.

Battleship Oklahoma, 3 per cent completed.

Torpedo boat destroyer Jarvis, 90 per cent completed.

Torpedo boat destroyer Downes, 10 per cent completed.

Naval tug Ontario, 90 per cent completed.

Naval tug Sonoma, 85 per cent completed.

Chinese cruiser Fei Hung, 50 per cent completed.

Oil tanker Rayo, for Standard Oil Co., 85 per cent completed.

Oil tanker El Segundo, for Standard Oil Co., 50 per cent completed.

Oil tanker Gulfoil, for the Gulf Refining Co., 60 per cent completed.

Harlan & Hollingsworth Corporation, Wilmington, Del.

Lumber and passenger steamer Columbia, for Wilson Bros. Co., for the Pacific coastwise trade; gross tonnage, 1,950; 1,200 I. H. P.

Freight steamer, John A. Hooper, for Sudden & Christenson, to be used in the Pacific coastwise trade; gross tonnage, 2,200; 1,700 I. H. P.

Lumber and passenger steamer California, for Olson & Mahoney, San Francisco, Cal.; gross tonnage, 1,800; 1,200 I. H. P.; to be used in Pacific coastwise trade.

Harbor lighter, Mauch Chunk, for the Central Railroad Co. of New Jersey, for use in New York harbor; gross tonnage, 491; 450 I. H. P.

Ocean tug Germantown, for the Reading Co., to be used in coastwise towing; gross tonnage, 647; 1,050 I. H. P.

Two passenger and freight steamers for the Central Vermont Trans. Co., for use on Long Island Sound; gross tonnage, 4,000; 4,800 I. H. P.

Fore River Shipbuilding Co., Quincy, Mass.

Four Holland submarine boats, Nos. K-1 and 2 and 5 and 6, for United States government.

Submarine tender Niagara, for United States government.

Torpedo boat destroyer Henley, for United States government.

Torpedo boat destroyer Duncan, for United States government.

Battleship Nevada, for United States government.

Argentine battleship Rivadavia.

Oil tank steamer Richmond, for Standard Oil Co.

Sulphur steamer, for the Union Sulphur Co.

Molasses steamer Nelson, for Cuba Distilling Co.

Seattle Construction & Dry Dock Co., Seattle, Wash.

Steel passenger steamer Potlatch, for Inland Navigation Co.

Steel passenger steamer Tacoma, for Inland Navigation Co.

Suction dredge, for United States government.

United Engineering Works, Alameda, Cal.

Oil tanker, for Standard Oil Co.

Towing steamer, for Northwestern Fisheries Co.

Lumber steamer, for S. S. Freeman Co.

Steel lumber steamer, for F. Linderman.

Wooden lumber steamer for the Hartwood Co.

Wooden lumber steamer, for J. Davenport.

Wooden lumber steamer, for the Hammond Lumber Co.

Wooden lumber steamer, for the E. L. Wood Lumber Co.

Wooden lumber steamer, for Charles H. Higgins.

Union Iron Works, San Francisco.

Two steam lumber schooners, for Loop Lumber Co.

Merrill-Stevens Co., Jacksonville, Fla.

Steel stern wheel steamer, 187 ft. long, for the Clyde Steamship Co.

Maryland Steel Co., Sparrows Point, Md.

Two colliers, Orion and Jason, for the United States navy department.

Eight steel steam freight vessels, for the American-Hawaiian Steamship Co., length over all, 429 ft.

Two bay passenger steamers, for the Baltimore, Chesapeake & Atlantic Railway Co.

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Work in Lake Ship Yards

AMERICAN SHIP BUILDING CO., CLEVELAND, O.

To be built at	Type or Name	Dimensions in feet. Overall.	Keel.	Beam.	Depth.	Dimensions of engines.	Dimensions of boilers in ft. and in.	Draft, forced or natural.	Steam pressure, lbs.	Capacity, gross tons.	For whom building.
Cleveland...	Sand str.	166	156	37	10	17½ 38½ x 30	Scotch	Natural	...	750 yds.	Pelee Island Sand & Gravel Co.
Lorain.....	*Bulk frtr.	600	580	58	32	24 39 65 x 42	2 Scotch 16 x 11½	Ellis & Eaves	170	12,000	Pittsburgh Steamship Co., Cleveland, O.
Lorain.....	*Freighter	600	580	58	32	24 39 65 x 42	2 Scotch 16 x 11½	Ellis & Eaves	170	12,000	Pittsburgh Steamship Co., Cleveland, O.
Lorain.....	Oil barge	260	250	43	25				...	1,000,000 gal.	Standard Oil Co., New York.
Wyandotte..	Pass. str.	500	485	58	23.6	66 96 96 x 108	†See foot note	Howden	165	.....	Cleveland & Buffalo Transit Co., Cleveland, O.
Lorain.....	*Oil bge.	260	250	43	25				...	.....	Standard Oil Co., New York.
Pt. Arthur..	Pass. str.	385	362	52	28.9	29½ 47½ 58 58x42	4 Scotch 15.6 x 11	Howden	200	.....	Northern Nav. Co., Ltd., Collingwood, Ont.
Pt. Arthur..	*Pkg. frtr. Calgarian	257	244	42.6	26.6	18 29 48 x 40	(2) 11.6 x 11	Ellis & Eaves	180	3,000	Canadian Interlake Line, Ltd., Toronto, Ont.
Cleveland...	Steel dump scow	180	...	40	...				200	800,000 gal.	Starke Dredge Co., Milwaukee, Wis.
Lorain.....	Oil str.	260	250	43	25	19 31 54 x 42	14.6 x 11.6	Natural	...	1,000,000 gal.	Standard Oil Co., New York.
Lorain.....	Oil bge.	260	250	43	25	19 31 54 x 42	14.6 x 11.6	Natural	...	800,000 gal.	Standard Oil Co., New York.
Cleveland...	*Oil str.	260	250	43	23	19 31 54 x 42	14.6 x 11.6	Natural	...	800,000 gal.	Standard Oil Co., New York.
Cleveland...	*Oil str.	260	250	43	23				...	1,000,000 gal.	Standard Oil Co., New York.
Cleveland...	*Oil bge.	260	250	43	23				...	1,000,000 gal.	Standard Oil Co., New York.
Cleveland...	*Oil bge.	260	250	43	23	24 39 65 x 42	16 x 11.6	Ellis & Eaves	170	12,000	Pittsburgh Steamship Co., Cleveland, O.
Lorain.....	*Bulk frtr.	600	580	58	32						
Pt. Arthur..	Sternwheel str.	227.6	200	40	8	16⅜ 35⅜ x 96	7.6 x 28.2½	Natural	200	.....	Canadian Pacific Ry., Fort William, Ont.

†Six single-ended Scotch boilers, 14 x 10.6; three double-ended Scotch boilers, 14.2⅛ x 20.5½.
*Isherwood system.

GREAT LAKES ENGINEERING WORKS, DETROIT, MICH.

Ecorse.....	A. A. Raven	390	370	48	30	19 27¼ 40 58 x 42	14.2 x 12	Great Lakes Forced	210	5,300	American Transportation Co., New York.
Ecorse.....	Ruby	261	241	43.6	29	21½ 35½ 58 x 42	14.2 x 12	G. L. Forced	180	3,000	American Transportation Co., New York.
	George Hawley										
Ecorse.....	Edison Light	261	241	43.6	29	21½ 35½ 58 x 42	14.2 x 12	G. L. Forced	180	3,000	Boston & Virginia Trans. Co., Boston, Mass.
Ecorse.....		261	241	43.6	29	21½ 35½ 58 x 42	14.2 x 12	G. L. Forced	180	3,000	Boston & Virginia Trans. Co., Boston, Mass.
Ashtabula...	15 barges	261	241	43.6	27.6	21 34½ 57 x 42	13 x 12.1¼	G. L. Forced	175	3,000	Alabama & New Orleans Trans. Co., New York.
Ashtabula...	Pkg. frtr.	261	241	43.6	27.6	21 34½ 57 x 42	13 x 12.1¼	G. L. Forced	175	3,000	Western Transit Line, Buffalo.
Borgne Canal, La.	Robt. M. Thompson	240	...	32	8	Producer gas or oil engine			...	1,000	American Transportation Co., New York.

TOLEDO SHIP BUILDING CO., TOLEDO, O.

Toledo.....	Sea-going frghtr.	261	249	43.6	27	21 34½ 57 x 42	(2) 13 x 11.7	Forced.	175	.....	Boston & Virginia Trans. Co., Boston, Mass.
Toledo.....	Sea-going frghtr.	261	249	43.6	27	21 34½ 57 x 42	(2) 13 x 11.7	Forced.	175	.....	Boston & Virginia Trans. Co., Boston, Mass.
Toledo.....	*Miss River Sternwheel str.	100	...	32	5.6	Engines of C.F. Ste. Marie to be installed	(6) 12 x 11		...	.....	Mackinac Transp. Co., St. Ignace, Mich.
Toledo.....	Car ferry	266	232	62	25				125	.....	

*Hull only.

MANITOWOC SHIP BUILDING & DRY DOCK CO., MANITOWOC, WIS.

Manitowoc..	Tug hull 50	92	82	22	12	18 x 38 30	13 x 12.6	Natural	180	.....	Chicago River & Indiana Ry. Co., Chicago, Ill.
Manitowoc..	Scow hull 55	...	...	....	..				...	1,600 cu. yd.	Fitzsimons & Connell Co., Chicago, Ill.

JOHNSTON BROS., FERRYSBURG, MICH.

Ferrysburg.	Gold dredge Natoma No. 7.	135	...	46.6	9.6				...	600	Natomas Consolidated of Cal., San Francisco, Cal.

COLLINGWOOD SHIP BUILDING CO., COLLINGWOOD, ONT.

Collingwood	Bulk frtr.	258.9	244	42.6	20	16 26 44 x 36	(2) 11.6 x 10.6	Howden Forced	180	2,250	Keystone Transp. Co., Ltd., Montreal, Can.
	canal str.	550	530	58	31	24 40 66 x 42	(3) 13 x 11	H'd'n Forced	185	13,000	St. Lawrence & Chicago Steam Nav. Co., Ltd., Toronto, Can.
Collingwood	Bulk frtr.					15 25 42 x 26	(2) 11.6 x 10.6	H'd'n Forced	180	.....	Dept. Marine & Fisheries, Canadian govt.
Collingwood	Single screw bucket dge.	218	210	37.6	14	15 25 42 x 26	(2) 11.6 x 10.6	H'd'n Forced	180	.....	Dept. Marine & Fisheries, Canadian govt.
Collingwood	Single screw bucket dge.	218	210	37.6	14						

POLSON IRON WORKS, LTD., TORONTO, MICH.

Toronto....	Ferry str. Kwasind	70	...	15	6.2	7 14 x 10	Fitzgibbon, 51 x 84 x 84 Scotch		150	.....	Royal Canadian Yacht Club Toronto, Can.
Toronto....	Tug	80	...	20	10	12 26 x 18	10 x 11 7 x 9		145	.....	Dept. of Public Works, Dominion govt.
Toronto....	Tug, steel	55	...	13	8.7½				150	.....	Dept. of Railways & Canals Dominion govt.
Toronto....	Drill boat Fogabola	80	...	30	6		Water tube		150	.....	John E. Russell, Toronto.

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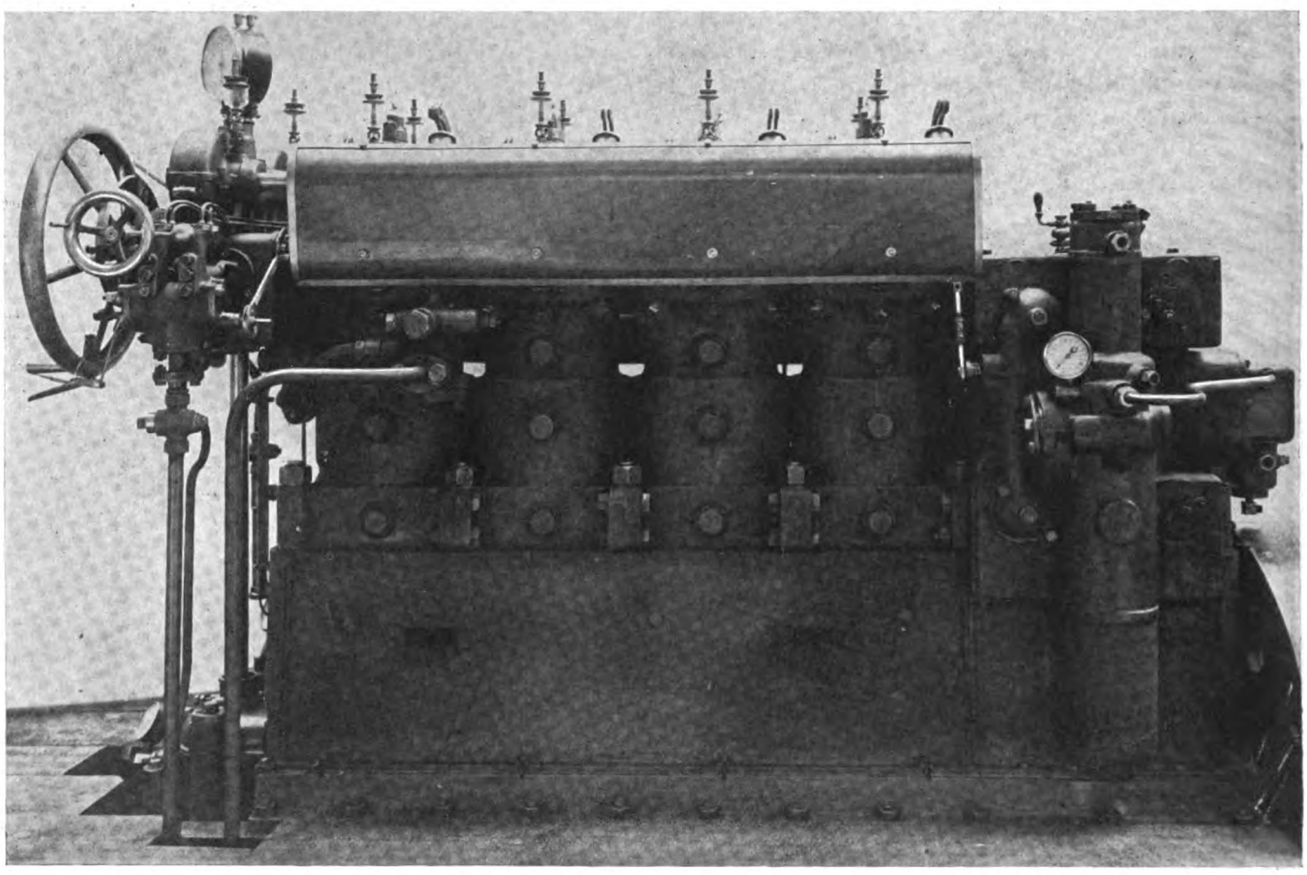
Crude Oil Engines

The Italian Navy Has Adapted the Kind Design and Has Installed One in a Small Tank Boat—Description of the Type

There has recently been installed in a small tank boat for the Italian navy a heavy oil engine, built by Ing. Paolo Kind & Co., of Turin, that has many elements of economy and safety to commend it as a reliable prime mover for small craft. This firm is manufacturing a medium-speed, high-pressure heavy oil engine from 10 H. P. up with fuel consumption varying from 0.42 to 0.59 lb. per effective horse power hour, and the cost of operation varies from one-third to one-half cent per effective horse power hour. The economy over an American marine engine of 50 H. P. burning gasoline is apparent. A Kind engine of 50 H. P. would consume 25 lbs. of crude oil at a cost of about 21 or 22 cents as against six and one-half gallons of gasoline at a cost of from 65 to 75 cents. A photo and sectional plan of the Kind heavy oil engine is herewith published. The engine is of the two-cycle type, using high compression to ignite the charge and the other features of air scavenging, fuel pulverization which are well known attributes of nearly all European makes. The Italian admiralty has adopted the Kind engine exclusively. The diagram herewith shows its installation in the tank boat of a four-cylinder 70 H. P. engine. This engine must not be confused with those using a hot bulb or torch to induce a preliminary heating of some part of the combustion chamber before the engine can be started. This thermic Italian motor works quite differently.



PHOTOGRAPH OF A 150 H. P. KIND CRUDE OIL ENGINE, BUILT IN ITALY AND ADOPTED BY THE ITALIAN NAVY. IT OPERATES ON THE TWO-CYCLE PRINCIPLE

The air compressed at about 30 to 35 atmosphere (440 to 525 lbs. per square inch), acquires a temperature sufficiently great to enflame (without the necessity of making preliminary red hot any part of the cylinder) the combustible previously pulverized by a compressed air jet, as soon as it is introduced into the cylinder. The introduction of the combustible is made gradually, starting from the dead point, so that instead of an explosion a combustion is produced, which does not sensibly increase the pressure acquired during the compression.

The process is, therefore, comparable to the introduction of the steam in a steam engine, and it is evident that the absence of the explosion is a valuable guarantee for the durability and safety of the engine. It may be stated that the high compression Diesel motors so far constructed are, in most cases, the old four-stroke cycle, where a firing takes place at every second revolution of the crank shaft. This Italian two-stroke motor, on the contrary, works after the two-stroke cycle, that is, a combustion for each cylinder for every revolution of the crank shaft, and so giving, it is said, a great advantage in favor of the running regularity and weight economy.

The operation, simply stated, is as follows: The piston (which acts as

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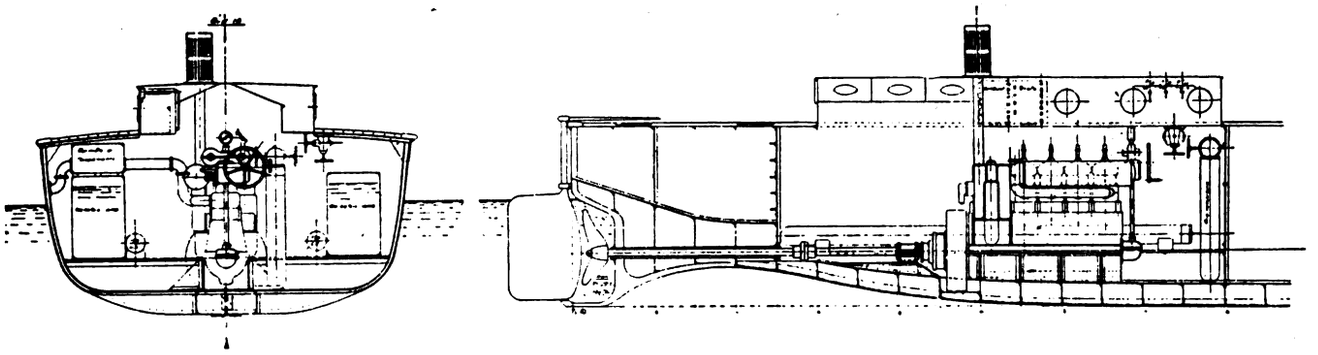


INSTALLATION OF 70-H. P. KIND AIR CONTROLLED HEAVY OIL ENGINE IN A TANK BOAT FOR THE ITALIAN NAVY

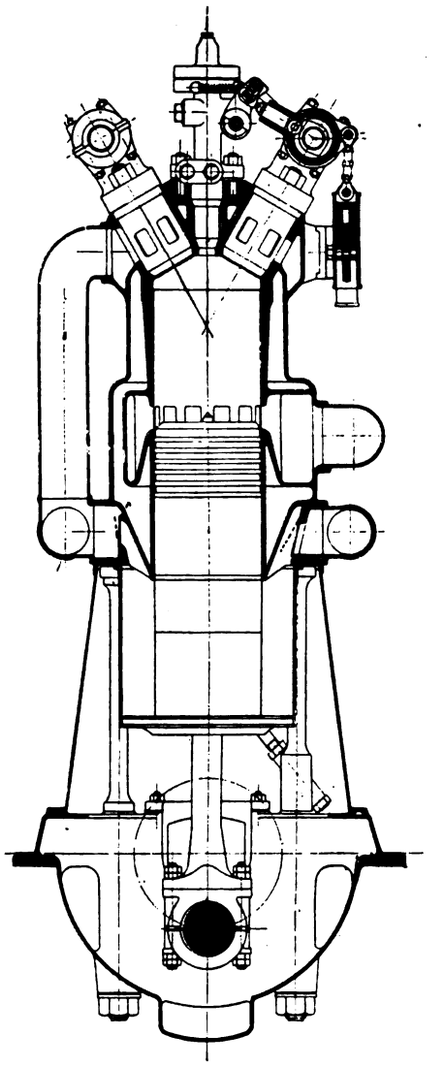
the cross head) sliding in the cylinder, closed in the upper part and open in the lower one, uncovers a series of exhausting slots placed in the cylinder at the lower dead point. In the cylinder cover are: A valve for starting, another for the admission of the air, and a third for the combustile. When the piston is at the lower dead point, the exhausting ports are open and the air inlet valves are also open. Through these last an air current passes into the cylinder, which blows off the remnants of the preceding combustion, and thus the cylinder is filled with pure air. After a time the inlet valves are closed and the piston in its upward stroke covers the exhausting ports and compresses the air at about 30 to 35 atmospheres (atmospheric pressure at 30 barometric reading and 62 degrees Fahr. is 14.7 pounds per square inch).

When the piston reaches the upper dead point and before starting the descending stroke, the fuel valve is opened and the pulverized combustile is admitted. By contact with the air, brought to an elevated temperature by the compression, the combustible is enflamed and keeps on entering and burning for a lapse of time determined by the power required; keeping the pressure nearly constant. During such lapse of time the piston will already have made a part of the descending stroke; then the fuel valve is closed and the expansion of the burned gases takes place up to the time when such gases helped by the air inlet escape through the exhaust ports which are now uncovered by the piston that has reached the lower dead point.

It may be stated that as soon as this is passed, the cycle already described is repeated. The starting valve serves to give the first impulse to the stopped motor, and works like a steam inlet valve. The compressed air for the injecion of the combustible is produced by a compressor with piston working steadily and, as soon as the motor is started, refurnishing also the air tank for the starting. The compressed air needed for the motor is contained in three tanks, two of which are for the starting, and one, for the injection of the combustible while the motor is running.

The air current for the cleaning and filling of the cylinders, is produced by a special pump keyed on the crank shaft.

The combustible is introduced into the cylinder by means of a special pump which administers in an exact way the quantity necessary for each impulse. A hand regulator, or a centrifugal regulator in the case of power plant, acts on the same pump, changing in a very sensible way the dosing of the combustible.



SECTIONAL VIEW OF THE KIND HEAVY OIL ENGINE

By means of a lever the valves are brought to the proper position to start the motor and after a few revolutions, by displacing the lever, the starting valves are put out of the way and the combustible inlet valves come into action and thus the motor takes its normal running.

It is claimed that these Italian motors can be reversed in two and one-fifth to three seconds, and it is pointed out that this special characteristic of the Kind reversible motor, does away with the possibility of dangerous mistakes due to unskillfulness. It is maintained that the starting is always instantaneous and even when left dle for months the motor can at once develop all its power. The running is completely automatic; and once started, the machine can be left to the care of the regulator. Refined petroleum as well as very dense oils can be used.

In the smallest, directly reversible, high-speed marine engines of 40 to 50 effective horsepower, with four cylinders, the number of revolutions is of 500 up to 650, while in the light, high-speed, 3,000-effective horsepower marine engines, the number of revolutions is reduced to 350 per minute. The weight of the high-speed and warship motor is reduced to 15 kilograms, or 33 lbs., per effective horsepower, while the weight of the normal, light type engine is from 44 to 66 lbs. per effective horsepower.

F. B. Slocum, of the Continental Iron Works, Brooklyn, N. Y., secretary of the Supplymen's Association of the American Boiler Manufacturers' Association, has published a list of the boiler manufacturers of the United States and Canada, which ought to be of considerable value to manufacturers of tools, material men, mechanical engineers and boiler builders. The price of the book is $5.00.

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Lake-Built Salt Water Ships

During the Past Two Years Lake Ship Builders Have Turned Out Considerable Tonnage for Coast Account—Their Workmanship Commended on All Sides

An interesting development has taken place on the great lakes during the past two years or more, and that is the construction of vessels for salt water service. These contracts have been secured in the open market and have been let strictly on the basis of the lowest and best bid. The work has been most satisfactory in every way and in fact more orders would have been secured were it possible to get larger ships to salt water through the Canadian canals. Within the dimensions of the canals, however, lake shipyards have demonstrated that they have nothing to fear from coast or foreign ship yards. At prices at present ruling abroad the lake yards can build quite as cheaply as Britain. Both Lloyds Register of Shipping and the American Bureau of Shipping have spoken in the highest terms of the recent production of lake yards. When Mr. Buchanan, Lloyds chief surveyor, came over from London to inspect some lake ships he frankly expressed his surprise and delight at the character of the workmanship displayed, saying that the riveting of the hull practically amounted to boiler construction.

Went to the Coast for Work

The financial panic of 1907, put a quietus upon ship building for lake trade and lake ship builders in order to keep their plants going were compelled to seek work wherever they could find it. It was necessity which drove them to the coast, and now having found a field there, they are not likely to abandon it. During the past two years lake ship yards have built over twenty vessels for coast account and that their work is clean and prices fair is proved by the fact that duplicate orders are coming in. It is probably not too much to say that hereafter lake shipyards will never be without a vessel or two on their stocks for the coast, especially so as the opening of the Panama canal will develop many collateral trades in which ships of the sizes that can readily pass through the Canadian canals will find employment.

As an evidence of this, the Great Lakes Engineering Works, of Detroit, has closed contract for the construction of fifteen self-propelling barges that are intended to be used in conjunction with the transportation of coal from the Black Warrior Basin in Alabama along rivers tributary to the Mississippi, the intention being to deliver the coal at New Orleans for general purposes, including the bunkering of ships. In fact, the bunkering of ships will unquestionably be a growing trade in the south, as vessels will undoubtedly require coal before resuming either their Pacific or Atlantic voyages after passing through the canal. Coal at Suez costs $6 a ton. It could be profitably sold at Panama for considerably less than this. Granting that it would only be $1 per ton less, the saving in the coal bill of a ship of about 3,000 tons in a round trip from New York to the Philippines would be about $2,600, a most important item.

The building of oil tankers is one of the most interesting features of ship construction at present. Ship yards all over the world are building this type of craft, there being probably fifty at present under construction in British yards. The American Ship Building Co. has during the past two years received orders from the Standard Oil Co. for sixteen oil tankers, all of them with one exception being for salt water service. Daniel E. Ford, of the Standard Oil Co., says of the Renown, recently completed by the American Ship Building Co., that she is the finest specimen of oil tanker that he has ever inspected.

Indorsed by Lloyds

James French, who has represented Lloyds Register of Shipping on the Great lakes for the past two years, has given unqualified endorsement to the work of the lake shipyards, saying that it is first class in every particular and equal to anything turned out on the Clyde. No man is more qualified to speak on this subject than Mr. French, because his experience has been large and he has made a most intimate study of lake construction since he came to this country. During his recent visit to Great Britain he found underwriters very much interested in this subject and perfectly willing to take lake risks.

Lake shipyards in their campaign for coast work have had to overcome prejudice. The earlier vessels sent to the coast, say some fifteen years ago, did not make a favorable impression. It is not surprising that they did not, as they were designed exclusively for lake trade with no thought whatever of ever reaching salt water. It was only the vicissitudes of trade that sent them there at all. Obviously they were not adapted to salt water conditions, lake shipbuilders earning a reputation which they by no means deserved. The vessels that have gone to the coast during the past two years from lake yards have reversed this opinion altogether. These vessels have created a very favorable impression and coast owners are beginning to pay some attention to the lakes.

Inquiries from the Coast

In this connection it is interesting to note that Charles Skentelbery, marine superintendent of the New England Coal & Coke Co., Boston, Mass., has just made a tour of lake yards, visiting Cleveland, Lorain, Toledo, Ashtabula, and Detroit. He said that the work which he had observed in all of the yards was extremely clean and creditable, not excelled anywhere. He was entirely spontaneous and unreserved in relating his impressions. The New England Coal & Coke Co. does an extensive business on the Atlantic seaboard. Until a few years ago coal was almost exclusively transported on the seaboard in schooners or in barges towed by tugs. Three or four years ago the New England Coal & Coke Co. built four colliers, the Everett, Malden, Melrose and Newton, which have given eminent satisfaction, and the company will undoubtedly gradually replace its wooden sailing tonnage with new steel steam tonnage. These colliers are considerably in excess of Canadian canal dimensions, being 406 ft. long and 52 ft. beam, and Mr. Skentelbery was non-committal on the subject as to whether the company contemplated the construction of a smaller-sized ship. There is no question whatever that if the Canadian canals were larger, lake shipbuilders would get more orders from the coast than they are getting.

The Great Lakes Engineering Works, which is now building five vessels for coast account, could have procured six additional contracts had it been possible to get the vessels through the canals. Reference to a table published elsewhere will show the amount of work that the lake shipyards are doing for coast account.

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The American Ship Building Co. is building eight, the Great Lakes Engineering Works five, and the Toledo Ship Building Co., two. Lake shipyards, while not having a great deal of new construction on hand for lake account, are nevertheless busy, the Great Lakes Engineering Works reporting that they are short of help and could employ 250 more men than they have been able to obtain.

The Bulk Freighter and Lake Trade

Herewith are appended a couple of tables upon which anyone associated with lake trade may put his own construction. One gives the movement of bulk freight (iron ore, coal and grain) on the great lakes during the past seven years; the other gives the number and capacity of the bulk freighters available to carry this freight. The table has been carried back only to the beginning of the year 1905, or since the advent of the so-called big ship into the bulk freight trade of the great lakes.

In compiling the table of bulk freighters, the lumber carriers and package freighters have been eliminated. There are between 250 and 300 lumber carriers on the lakes, but none of them carry ore. They occasionally carry coal, but they are being gradually eliminated from this trade as completely as they are from the ore trade. The package freighters of course never carry coal or ore, but they do carry grain. Mention is made of these circumstances in order that each one may figure for himself what inroads into the available bulk freight these collateral carriers make.

Table I shows the additions and subtractions that have been made during the past seven years in the bulk freight carrying fleet. The launchings given are those of bulk freighters

TABLE I.

Year.	Launchings.	Subtractions.
1905	29	33
1906	40	18
1907	40	16
1908	24	4
1909	17	5
1910	20	17
1911	5	8
Total	175	101

only; the list of subtractions are also bulk carriers only, and are made up of actual losses through the elements, removals to the coast, or transfers to other trades. The figures show that during the past seven years 175 bulk freighters have been added to the available fleet and 101 removed.

An impartial analysis of the figures leaves a rather favorable impression and does not make out a bad case for the ship. It looks as though the trade would speedily absorb the tonnage now available to carry it. During 1905, 57,578,550 net tons of freight were moved and there were available to move it, 518 bulk freighters of 1,919,285 gross tons carrying capacity. Thirty cargoes are probably a high average for a season and if all these bulk freighters had carried 30 cargoes, they would have moved 57,578,550 gross tons during that year. Of course, the bulk freighters did not move all of this bulk freight, because the package freighters and lumber carriers undoubtedly made some inroads into the coal and grain trades; nor did all of the bulk freighters make thirty trips. Strandings, stress of weather and unforeseen circumstances must have delayed a portion of them. During 1910, 81,427,406 net tons of freight were moved and there were available on Jan. 1, 1910, 589 bulk freighters of 2,973,447 gross tons available to move it. These vessels could have moved in 30 cargoes 89,203,410 gross tons. This of course is considerable excess of tonnage capacity over freight offering, but then the lake freight trade has been known to increase 10,000,000 tons in a single year.

BULK FREIGHT MOVEMENT OF THE GREAT LAKES.

TABLE II.

Year.	Iron ore. Gross tons.	Coal. Net tons.	Grain of various kinds. Net tons.	Total. Net tons.
1905	33,475,904	14,401,199	7,515,875	59,410,086
1906	37,513,589	17,273,718	8,407,959	67,696,897
1907	41,290,709	21,486,927	8,617,375	76,349,896
1908	25,427,094	19,288,098	7,409,140	55,175,585
1909	41,683,599	18,617,396	8,255,444	73,558,471
1910	42,618,758	26,478,068	7,216,329	81,427,406
1911	32,130,411	25,700,104	8,742,228	70,428,392

TABLE III.

CARRYING CAPACITY OF LAKE BULK FREIGHTERS.

Year.	No. of vessels. Jan. 1.	Carrying capacity—Tonnage of same. Gross tons.	Carrying capacity—New tonnage constructed. Gross tons.	Carrying capacity—Tonnage subtracted. Gross tons.
1905	518	1,919,285	260,200	114,374
1906	514	2,065,111	381,000	40,987
1907	542	2,442,754	368,000	46,973
1908	567	2,766,781	101,400	14,837
1909	587	2,853,344	157,300	37,197
1910	589	2,973,447	194,500	60,617
1911	592	3,108,330	55,000	29,477
1912	589	3,135,953	.....	.....

To Build Fifteen Steel Barges

The Great Lakes Engineering Works, of Detroit, has received an order from the Alabama & New Orleans Transportation Co. for the construction of fifteen self-propelling steel barges to ply between the Black Warrior coal basin in Alabama and New Orleans through Black Warrior, Tombigbee and Mobile rivers, Mississippi Sound and Lake Borgne canal.

The barges will be built on Lake Borgne canal where a construction shop of the typical shipyard type will be erected about 10 miles north of New Orleans. The shop will be built parallel to the lake bank and the barges will be launched sideways. In addition to the fabricating of ships, the equipment of the yard will comprise a marine railway. The barges are to be 240 ft. long, 32 ft. wide and 8 ft. deep, having a carrying capacity of 1,000 tons on 6 ft. draught. They will be driven either by producer gas or oil engines. Experiments are now under way for the utilization of coke breeze in the production of producer gas. If the experiments result favorably the barges will be operated by producer gas, as there is an unfailing supply of coke breeze, practically a waste product, to be obtained in the Birmingham district. While there is no material difference in the cost of installing either producer gas or oil engines, it is estimated that the cost of operating producer gas engines will be only one-sixteenth of that of operating oil engines, owing to the cheapness and abundance of the fuel.

The enterprise is a totally new one and is merely another evidence of what one may expect of southern development when the Panama canal is completed. During the past 20 years the federal government has spent nearly $8,000,000 to make the rivers in which these barges will ply navigable. To finance its plan the Alabama - New Orleans Transportation Co., a New Jersey corporation, will issue $2,000,000 of 20-year 5 per cent gold bonds, of which the Union Trust Co. of Detroit, is the trustee. The barges will traverse a waterway of about 515 miles in length. At Grant's Pass there is a toll charge of $4 per barge on each passage, while at the Lake Borgne canal, which is owned by the company, a toll of 10 cents a gross ton will be levied. The mines in the Black Warrior basin last year produced 5,472,000 tons of coal. This coal is now being hauled by rail to New Orleans at a cost, including switching and terminal charges, of

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$1.30 per ton. It is expected to make the water rate $1.20 a ton, which would show a profit of 37 cents a ton, exclusive of the toll of 10 cents which will be collected at Lake Borgne canal. It is the expectation also to build up a return freight in scrap iron and Cuban ores, as well as to engage in the business of bunkering ships at New Orleans, which will, of course, involve the construction of a fueling barge.

Officers of the company are: President, Phineas W. Sprague, Boston, one of the largest coal shippers of New England; treasurer, Vincent Goldthwaite, Boston, a director in the Massachusetts Gas & Electric Co.; vice president and general manager, John H. Bernhard, engineer from Amsterdam, Holland, who originated the project. Directors of the company include also H. H. Melville, New York, director in the Lake Superior Iron & Chemical Co.; Cecil A. Grenfell, London, Eng.; H. S. Fleming, New York, associated with the Berwind, White Coal Co.; Charles R. Dunn, Detroit, vice president and treasurer of the Union Trust Co.; George R. Carr, Chicago, vice president of the Dearborn Drug & Chemical Co., Breck Musgrove, Birmingham, Ala., coal dealer; A. S. Lyons, Mobile, Ala., director of the City Bank & Trust Co.

Steamer for Canadian Pacific

The Western Dry Dock & Ship Building Co., which is the Canadian yard of the American Ship Building Co., is building a very interesting little stern paddle-wheel steamer for the Canadian Pacific Railway for service on Kootenay lake, near Nelson, B. C. The steamer is 227 ft. 6 in. over all, 200 ft. keel, 40 ft. beam and 8 ft. deep, and is designed to draw 4 ft. 6 in. of water. Her engines are twin tandem compound, 16⅜ and 35⅜ x 96 in. stroke, driving a stern paddle wheel 24 ft. 6 in diameter. The engines are 75 ft. long from end to end, mounted on steel girders. A novel feature is that the connecting rod is built of channel and T iron 35 ft. centers. The engine was made as light as possible, as weights naturally have to be kept at a minimum. The main steam piping is of steel tubing ⅛-inch thick for 200 lbs. pressure. The main wheel shaft is 13 in. diameter of hollow forged nickel steel. The engine was built at Cleveland and shipped to Port Arthur where it was erected and shipped in an erect condition on two cars to Nelson. The hull itself will be shipped to Nelson in a knocked-down condition and it is estimated that it will require twenty-eight cars to transport it. D. Stevens, marine superintendent of the Canadian Pacific Railway, is superintending the construction of the steamer.

Dispatch in Ore Unloading

A record for dispatch in ore unloading was made by the steamer Wm. P. Palmer, at Conneaut, on July 26, when 11,044 gross tons of Group 3 ore was unloaded in 3 hours 15 minutes. The unloading began at 7:53 a. m. and was finished at 11:08 a. m. The machines employed were four 10-ton steam Hulett machines, one 15-ton electric Hulett machine and four 5-ton Brown electric machines. The detail per machine was as follows:

Hulett steam machine: No. 1, 3 hrs. 6 min., No. 2, 3 hrs. 10 min., No. 3, 3 hrs. 15 min., No. 4, 3 hrs. 4 min.; total four machines, 12 hrs. 35 min.

Brown electric machines: No. 1, 3 hrs. 14 min., No. 2, 3 hrs. 12 min., No. 3, 3 hrs. 15 min., No. 4, 3 hrs. 11 min.; total four machines, 12 hrs. 52 min.

Hulett electric machine: No. 1, 2 hrs. 56 min.

Total nine machines: 28 hrs. 23 min.; tons per hour, gross time, nine machines, 3,398.

In unloading the steamer J. P. Morgan in 3 hours 12 minutes at Conneaut on July 10, a record for dispatch was achieved without intention. No special preparations were made for unloading the boat in quick time, but it so happened that the conditions on the dock permitted all the machines to begin unloading simultaneously. This condition does not always arise because as a rule the machines are divided among different boats. The unloading commenced at 1:11 P. M. and finished at 4:23 P. M., the elapsed time being 3 hours and 12 minutes. The tonnage was 10,291 gross tons of Group 4 ore. The tons per hour for nine machines, start to finish, was 3,347.5. This grade of ore, Group 4, is bulky and is not favorable for rapid unloading as it sticks to the bucket. It is reasonable to assume that if the boat had contained an ore that handled freely that 20 minutes would have been clipped off the unloading time.

Steamer Bellechasse

The steamer Bellechasse, designed as a survey and inspection steamer for the St. Lawrence ship canal service, was recently launched from the yard of the Kingston Dry Dock Co., Kingston, Ont. The steamer is 140 ft. long over all, 130 ft. long, 27 ft. beam and 13½ ft. deep. The hull is of steel divided into five watertight compartments and has been specially strengthened to operate in light ice. The propelling machinery consists of two sets of triple-expansion engines with cylinders 12½, 21 and 34 in. diameter by 21 in. stroke, supplied with steam from two cylindrical boilers, allowed 180 lbs. pressure. The bunkers are placed longitudinally on each side of the boiler room and have a capacity of about 100 tons.

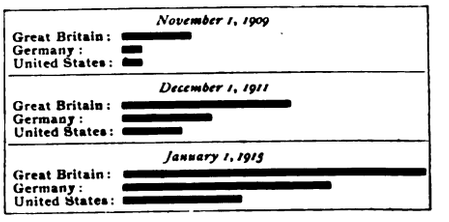
Trials of Battleship Arkansas

During the trials of the battleship Arkansas she struck a reef off Rockland, Me., while proceeding at about 13 knots. She struck under the port bow, just under the turn of the bilge and close to the keel, scraping along the reef for a distance of 44 ft., denting her ¾-in. plates and shearing off a number of rivets. After anchoring and examining the damage, it was decided to proceed with the trials as the injury was not serious. Her contract speed is 20.5 knots. On her highest run she made 21.493 knots. The table herewith gives the results of her various trials.

Trial.	Speed.	R.P.M.	S.H.P.
24-hr. 12-kt.	11.993	175.70	4,354
24-hr. 19-kt.	19.410	291.32	20,592
4-hr. full speed.....	21.051	323.83	28,534
2-hr. burning coal and oil	20.989	322.13	28,043
Average five highest standardization runs	21.20	328.00	28,751

Comparative Naval Strength

Herewith is published a diagram showing the naval strength of Great Britain, Germany and the United States in capital ships. On Jan. 1, 1912, Germany had nine capital ships



and the United States six, but on Jan. 1, 1915, according to the program laid down, the United States will have only 12 and Germany 21. The diagram includes the cruisers Michigan and South Carolina.

The Manitowoc Ship Building & Dry Dock Co. has received contract to build a tug for the Milwaukee Tug Line.

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July Ore Shipments

July gave evidence of what the lake fleet is capable of doing. Notwithstanding shortage of cars, vicissitudes of weather and numerous unforeseen troubles, the fleet broke the June record easily. The movement reached 7,600,283 tons as against 7,567,555 tons for June, and it was practically all handled in contract vessels. Wild carriers got very little of it, shippers having about all they could do to keep contract vessels busy. The movement to Aug. 1, totals 21,290,904 tons, as against 14,064,291 tons, for August, 1911. The movement is rapidly overtaking 1910, when 21,863,549 tons were moved up to Aug. 1. Following is the summary by ports:

Port.	July, 1911.	July, 1912.
Escanaba	644,098	836,346
Marquette	309,438	513,924
Ashland	439,843	771,057
Superior	1,747,364	2,324,324
Duluth	1,108,316	1,540,324
Two Harbors	972,314	1,616,258
Total	5,221,373	7,600,233
1912 increase		2,378,860

Port.	To Aug. 1, 1911.	To Aug. 1, 1912.
Escanaba	1,711,806	2,478,294
Marquette	843,177	1,430,814
Ashland	1,102,263	2,103,858
Superior	4,698,855	6,668,655
Duluth	7,158,450	4,385,802
Two Harbors	2,549,740	4,223,481
Total	14,064,291	21,290,904
1912 increase		7,226,613

Lake Erie Ore Receipts

Out of total ore shipments of 7,600,233 tons during July 6,086,254 tons went to Lake Erie ports, distributed as follows:

Port.	July, 1912. Gross tons.
Buffalo	706,215
Erie	50,841
Conneaut	1 341,758
Ashtabula	1,368,024
Fairport	349,500
Cleveland	1 415,528
Lorain	583,735
Huron	74,097
Sandusky	.....
Toledo	162,688
Detroit	33,868
Total	6.086,254

Foreign Interests Ordering Ships

W. R. Grace & Co., of London, have placed an order with Cramps, Philadelphia, for four steamers for service between the Atlantic and Pacific ports, the first that a foreign interest has as yet placed with American yards. Grace & Co. are large operators, and do an extensive business, especially on the Pacific coast of North and South America, and the placing of the order in this country is doubtless for the purpose of obtaining American register for the vessels in order that they may engage in the coastwise trade of the United States and receive whatever contributory benefits there may be in the proposed Panama canal legislation. The new steamers are to be 405 ft. long, and of about 10,000 tons carrying capacity.

Commerce of Lake Superior

During July 10,781,304 net tons of freight passed through the canals at Sault Ste. Marie, an increase of 34,145 over the June movement. The movement to Aug. 1, was 30,632,074 tons, as against 22,939,511 tons, for the corresponding period of 1911, an increase of 7,692,563 tons. Following is the summary:

EAST BOUND.

	To Aug. 1, 1911.	To Aug. 1, 1912.
Copper, net tons	55,860	46,938
Grain, bushels	13,983,839	22,126,172
Building stone, net tons.	3,142	2,282
Flour, barrels	2,485,779	2,973,074
Iron ore, net tons	13,403,160	20,245,785
Pig iron, net tons	15,169	5,714
Lumber M ft., B M	247,370	284,262
Wheat, bushels	28,621,113	55,355,445
Unclassified freight, net tons	49,873	99,792
Passengers, number	18,528	14,955

WEST BOUND.

Coal, anth., net tons	938,432	505,225
Coal, bitu., net tons	5,899,591	5,981,229
Flour, barrels	125	.....
Grain, bushels	1,100	.....
Mfd. iron, net tons	181,446	290,934
Iron ore, net tons	9,486	3,188
Salt, barrels	303,043	362,286
Unclassified freight, net tons	565,727	531,467
Passenbers, number	21,935	17,063

SUMMARY OF TOTAL MOVEMENT.

East bound, tons	15,299,750	23,266,029
West bound, tons	7,639,761	7,366,045
Total	22,939,511	30,632,074
Vessel passages	8,088	10,020
Registered tonnage, net	18,010,793	24,631,067

Longitudinal Ship Construction

Editor MARINE REVIEW:—We recieved a copy of THE MARINE REVIEW, Vol. 42, No. 7, of July, 1912, in which is an article marked "Isherwood Patent Granted". In this article you gave the name of a number of ship yards who have under way or under order, vessels for construction under this system, and give our name, viz., James Rees & Sons Co., Pittsburgh, Pa., 3. The firm of James Rees & Sons Co. are building these vessels on a line on which they did have a patent and which patent has expired, wherein the bottom of skin of the boat was secured to the frame of the vessel; the longitudinal ship construction is not new to the ship yards on our western rivers, and we will continue on the line we have always constructed, without regard to any patent which may have been issued recently, simply because there is nothing new in the construction of our boats but what we have used during the last 30 or 40 years. Therefore, I wish you to make a broad denial that we are using the invention or new design of any man in the construction of our boats, which you stated in the above mentioned article we were, and we surely will not ask any license to continue in the same line and method.

Yours truly,
JAMES REES & SONS CO.,
T. M. Rees, General Manager.
Pittsburgh, Pa., July 22, 1912.

An error was made in crediting the construction of these three barges to James Rees & Sons. They are being built by the American Bridge Co., at Ambridge, Pa., for the Texas Steamship Co., 17 Battery place, New York, under the supervision of George B. Drake, naval architect. John H. Dialogue & Son, Camden, N. J., are also building three. The six barges are all on the Isherwood system, and are 135 ft. over all, 35 ft. molded beam, and 9 ft. molded depth.

Obituary

Capt. John H. Bartow, president of the Lake Erie Ore Co., died at his home, 2066 East Eighty-ninth street, Cleveland, on July 10, at the age of 68 years. He had been identified with lake trade practically all his life. He settled in Cleveland about 30 years ago, and engaged in the vessel brokerage business with B. L. Pennington, and later was associated with Capt. J. W. Moore, forming eventually the firm of Moore, Bartow & Gilchrist. For the past ten years he had been engaged in the ore business and was the head of the Lake Erie Ore Co., operating mines in the Lake Superior district.

Capt. James J. Rardon died at his home in Chicago on July 31. He was one of the best known vessel owners and brokers on the lakes, having been identified with the trade since boyhood. He began his career on sailing vessels, later coming ashore to establish a vessel brokerage and insurance business at Chicago, first associating himself with C. A. McDonald and later with C. W. Elphicke & Co.

Personal

Walter B. Pollock, manager marine department, New York Central Lines, has left for a trip to the Pacific coast.

James French, principal surveyor of the chief ship surveyor's staff for Lloyds Register, will make his headquarters in New York hereafter. His place in Cleveland will be taken by O. Norbeth as hull surveyor, J. S. Heck remaining as engine surveyor.

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Accidents to Lake Vessels

Since the opening of navigation many accidents, some of them of a serious nature, have occurred. even of them are either total losses or total constructive losses. The tug Charles A. Trinter was totally destroyed by fire at Vermillion on April 25. The Canadian steamer Iona, coal laden, took fire on Lake Ontario on May 20 and burned to the water's edge, the crew escaping in lifeboats. The little steamer Joseph C. Suit was accidentally hit by the City of Detroit III approaching the dock and was sunk. The Canadian steamer Bothnia was sunk in St. Clair river in collision with the steamer S. S. Curry, on June 26, being practically cut in two when the Curry sheered into her through a disabled rudder. The steamer Sidney C. McLouth was destroyed by fire on Green Bay on June 28. The steamer Viking ran ashore at Split Rock, Lake Superior, and will probably be abandoned to the underwriters as a constructive total loss. The steamer Columbia, of Niagara Falls, was badly damaged by fire at Ogdensburg on July 5 and may be a total loss.

Losses of life have also occurred. Five men lost their lives in an explosion on Standard Oil Barge No. 88 while lying near the Great Lakes Towing Co.'s yard in the Cuyahoga river. Two lives were lost by the bursting of steam pipes in the engine room of the steamer James Davidson on Lake Superior.

The steamer James H. Hoyt met with a serious accident by grounding near Garden Island, damaging 81 frames and 13 plates. Captain Thomas Garrity was dismissed from the service of the Pittsburgh Steamship Co. on account of this accident.

The steamers P. P. Miller and Victory were in collision in St. Clair river, the Miller endeavoring to pass the Victory, both upbound, while a downbound steamer was approaching. The collision might have been serious, but was avoided by skillful maneuvering.

An analysis of the more important accidents will develop the fact that practically all of them could have been avoided by careful observance of the rules of navigation. The summary is as follows:

Some of the losses will entail considerable repairs, notably the steamer G. J. Grammer, which was sunk in collision with the steamer Northern Queen near Corsica Shoal, Lake Huron, on July 14. She was raised and taken to Port Huron where temporary repairs were made. Later she went into dry dock at Cleveland where three weeks were spent in making repairs. The accident is supposed to have been caused by the steering engine of the Northern Queen choking.

In coming down on the Canadian side of the river on July 14, the steamer W. K. Bixby hit the lightship Kewaunee which had been anchored over the wreck of the sunken steamer Joliet. The Bixby dragged her length over the Joliet and did considerable damage to her bottom. Repairs on her will amount to about $30,000 as about 70 plates were damaged.

The steamer G. Watson French collided with the steamer Mataafa off Grosse Point, Lake St. Clair, on July 27, damaging the Mataafa very badly. A survey at Toledo shows that her port side is broken in and bent for a distance of 100 ft. with severe buckling of the deck. She will be about three weeks in dry dock.

The accidents have been sufficiently numerous to keep the ship yards busy for several weeks.

Date.	Name of Vessel.	Nature of Accident.	Place.
Jan. 8	Tug Townsend Davis.....	Cut through by ice and sank; floated Jan. 23.....	Erie, Pa.
Jan. 8	Str. Ball Brothers.....	Damaged by fire; cabins badly burned; damage estimated at $6,000	Duluth, Minn.
Mar.	C. F. Pere Marquette 20.....	Damaged her wheel in ice; repaired at Milwaukee.....	
Mar. 13	C. F. Pere Marquette 19.....	Ran aground; one plate under engine room punctured.....	Near Manitowoc, Lake Michigan
Mar. 16	C. F. Pere Marquette 16.....	Damaged by fire; temporarily repaired at Milwaukee.....	
Mar. 19	Str. Conestoga	Stranded; docked at Milwaukee for new wheel.....	Donges Bay, Milwaukee.
———	Str. Flora M. Hill.....	Crushed in ice and sank; to be raised.....	Near Chicago, Lake Michigan.
———	C. F. Marquette & Bessemer No. 2	Broke her wheel in heavy ice; released herself; docked for repairs to her stern bearing on June 7.....	Near Conneaut, Lake Erie.
Apr. 12	Str. Sahara	Lines parted and she hit Str. Schoonmaker, damaging one plate..	Ashtabula.
Apr. 20	Str. J. J. Barlum.....	Engine trouble encountered shortly after she left port; put back to breakwater	Near Milwaukee, Lake Michigan
Apr. 24	Str. Powell Stackhouse	Stranded; No. 1 tank leaked and forepeak filled with water; released after lightering; unloaded at Milwaukee and then left for South Chicago where she was docked; left dry dock May 22...	Lansing Shoal, Lake Michigan.
Apr. 24	Str. Selwyn Eddy	Hit Chicago Ave. bridge while coming out of harbor; leaked.....	Chicago harbor.
Apr. 25	Tug Chas. A. Trinter.....	Burned; loss, $3,000	Port Clinton, O.
———	C. F. Marquette & Bessemer No. 1	Damaged two bow plates in ice.....	
———	Str. Chas. A. Weston.....	Hit by Str. Congdon which broke away from tugs and had two plates damaged	Milwaukee, Wis.
Apr. 30	Str. Simon Langell.....	Stranded; released by tug Harding.....	Grassy Island, Detroit river.
May 1	S. O. Bge. No. 88.....	Damaged by fire caused through explosions; five lives lost; barge not seriously damaged, but will have to have new booms, spars and sails	Cleveland, O.
May 2	Str. Empress of Midland.....	Ran ashore in fog; released on eighth by tugs and went to Collingwood. Ont., for repairs	Cabot's Head, near Tobermoray, Ont.
———	Str. James H. Hoyt.....	Struck and was docked at Superior upon arrival there May 6; leaked; left dry dock May 28.....	Straits of Mackinac.
———	Str. Turret Court	Ran aground; had to lighter	Fort William Harbor.
May 4	Gravel barge	Hit by Str. Wyandotte while turning; hole stove in barge, sinking her instantly	Menominee river.
May 4	Str. Agassiz	Ran aground	Portage Lake.
May 5	Str. Frank Rockefeller.....	Collided with Str. E. D. Carter in thick weather; bow stove in to forward bulkhead; repaired at Superior; repairs completed May 18	Superior, Wis.
May 5	Str. E. D. Carter.....	Collided with Str. Frank Rockefeller in thick weather; three or four plates in bow damaged and anchor broken.....	Superior, Wis.
May 5	Str. James E. Davidson.....	Ran ashore in thick weather; released on May 7 after lightering 75,000 bu. of grain; reloaded lightered cargo and proceeded on her trip. Docked at Toledo for repairs.....	Pelee Island, Lake Erie.
May 5	Str. Cherokee	Ran aground at lower end of Island; released May 7 by dredging	Fighting Island.
———	Str. Francis L. Robbins.....	Struck in heavy weather; leaked badly; all damage on starboard side; docked at Superior; 17 plates had to be removed, 10 of which were replaced with new ones; 35 damaged frames; ten or twelve to make repairs.....	Manitou Island.
———	Str. P. P. Miller.....	Struck in heavy weather; only slightly damaged.....	Manitou Island.
May 6	Str. America	Ran aground; tug and lighter sent to her; released on May 8; leaked; repaired at Manitowoc.....	White Shoal, Lake Michigan.
———	Str. Bethlehem	Struck on her way up lakes; docked at Chicago; bent rudder,	

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			broken quadrant and possibly bottom damage	
May	7	Str. Smith Thompson	Stranded, owing to derangement of steering gear; released on May 9 after lightering	Sault river.
———		Str. Shenango	Struck, going up; docked at Ashtabula; six damaged plates and 12 broken frames	Detour, St. Mary's river.
May	12	Str. Sultana	Ran ashore in heavy sea; tugs sent to her; released on May 14..	Long Point, Lake Erie.
———		Str. Fred G. Hartwell	Arrived at Port Huron on May 14 with disabled steering gear; towed to Detroit for repairs	
———		Str. Roman	Ran ashore; tug sent to her; large part of cargo lightered and released on May 17	Whaleback Shoal, Green Bay.
May	15	Str. Victory	Ran into dock and broke her quadrant; delayed several days....	Lorain harbor.
———		Str. E. J. Earling	Severely pounded in storm; rivets loosened; docked at Lorain May 20; one week to make repairs	Lake Michigan.
May	18	Str. A. E. Ames	Ran into Grand Trunk bridge, damaging it severely; harbor blocked about a week by accident	Hamilton, Ont.
May	18	Sch. J. B. Lozen	Hit light on extension of east arm; not damaged	Cleveland breakwater.
May	18	Str. Conemaugh	Ran aground; released by Favorite	Corsica Shoal, Lake Huron.
May	19	Str. Iona	Burned to water's edge and then sank; loss estimated at $20,000..	Lake Ontario, near Oswego, N. Y.
May	19	Str. Victory	Collided with Str. L. B. Miller; slightly damaged	St. Clair river.
May	19	Str. L. B. Miller	Collided with Str. Victory; slightly damaged	St. Clair river.
May	20	Str. A. E. McKinstry	Collided with Str. Corunna; two plates damaged and five frames broken. Repaired at Kingston	Welland canal.
May	20	Str. Corunna	Collided with steamer McKinstry; slightly damaged	Welland canal.
———		Str. H. P. Bope	In backing out of slip hit dock and broke her quadrant	South Chicago.
———		Str. Toiler	Ran ashore; released on May 31 after lightering 35,000 bu. of grain. Docked at Kingston June 10	Foot of Galops Rapids, near Ogdensburg.
May	21	Str. James Davidson	Eight men severely burned by bursting of steam pipe; steamer hastened to Marquette where injured were taken ashore; two died	Lake Superior.
May	23	Sand Str. Mulinix	Turned turtle, engines and boilers dropping out; floated June 14; considerably damaged	Toledo, O.
May	23	Str. India	Got a line in her wheel and ran on beach	Shelldrake.
———		Str. J. Spaulding	Lost her rudder; anchored off Cheboygan; tug sent to her from Sault which steered her to Milwaukee, whither she was bound; docked for new rudder	Lake Huron.
May	27	Str. Frontenac	Collided with barge Chattanooga; hole pierced in her abreast the coal bunkers 4 ft. above water line, breaking the plates	Off Grand Island, Lake Superior
May	27	Bge. Chattanooga	Collided with Str. Frontenac; lost an anchor and broke hawse pipe	Off Grand Island, Lake Superior
May	28	Str. Imperial	Broke four gates, delaying navigation considerably	Cornwall canal.
———		Str. Arabian	Collision; lost her rudder in the rapids	St. Lawrence River, near Morrisburg.
May	30	Str. Andaste	Collided with barge Thompson; hit on port side abreast of boiler-house; four plates cracked and damage extended down below water line; cargo hold began to fill and to prevent sinking she was beached. Accident occurred when Andaste endeavored to pass Str. Warner and her tow, the Thompson; floated May 31 after lightering 500 tons of ore and taken to Sault for temporary repairs; docked at Cleveland June 6 and repairs were completed on May 13; seven or eight damaged plates	Hay Lake, St. Marys river.
May	30	Bge. A. W. Thompson	Collided with Str. Andaste; few plates bent; damage slight	Hay Lake, St. Marys river.
May	31	Str. Joseph C. Suit	Struck by Str. City of Detroit III while on her trial trip, being torn from her moorings; sank; probably total loss	Detroit river.
June	4	Str. W. H. Gratwick	While leaving port hit Str. Rensselaer	Conneaut, O.
June	4	Str. Rensselaer	Hit by Str. W. H. Gartwick; cabin stove in and life boats carried away	Conneaut, O.
———		Str. City of Bangor	While turning around; struck an obstruction and lost her wheel; towed to Cleveland; new wheel and hub put on	Escanaba, Green Bay.
June	4	Steel scow	Capsized in strong wind and sank; (towed by Str. Lakeside) probably total loss; valued at $20,000	
June	6	Str. Frank J. Hecker	Ran ashore in fog; released herself, uninjured	Near Crisp Point, Lake Superior
June	7	Str. J. B. Nielson	In landing hit the dock; slightly damaged; repaired at Superior...	Two Harbors, Minn.
June	13	Str. M. C. Smith	Hit by Main Ave. bridge but was not damaged; bridge damage estimated at $4,000 or $5,000	Cleveland, O.
June	13	Str. Viking	Ran hard aground; released on June 17, uninjured	Toledo, O.
June	15	Str. Bge. Pawnee	Broke her crank shaft; towed to Detroit for repairs	St. Clair river, near Port Huron
———		Str. City of South Haven	Struck a log; docked at Chicago for repairs to her rudder	Manistee, Mich.
June	18	Str. Rutland	Collided with Str. United States	Chicago.
June	18	Str. United States	Collided with Str. Rutland	Chicago.
———		Str. Cadillac	Ran aground; lightered; docked at Ashtabula; 20 damaged plates, half of which must be replaced; repairs completed July 5	Deseronto, Ont.
June	20	Str. Canadian	Carried away four gates of Lock 22; break repaired on June 21...	Welland canal.
———		Str. Renvoyle	Struck; docked at Ashtabula June 21 for repairs	Kingston, Ont.
———		Str. Manitou	Ran ashore; tugs ordered to her from Sault	Lonely island, Georgian bay.
———		Str. Shenango	Lost an anchor	Near Sailors' Encampment, St. Marys river.
———		Str. Wm. Nottingham	Lost an anchor	Below Poe Lock, Saulte canal.
June	20	Str. George B. Leonard	Lost an anchor	Sandusky.
June	21	Str. Holland	Broke her walking beam cylinder and piston rod; towed to Chicago	Lake Michigan.
June	22	Bge. Harold	In tow of Str. P. J. Ralph when the steamer collided with the Str. Socapa; considerably damaged	Head of Stag Island, St. Clair river.
June	22	Str. Socapa	Collided with Str. P. J. Ralph, towing the barge Harold; slightly damaged	Head of Stag Island, St. Clair river.
June	23	Str. Neptune	Struck obstruction and broke two buckets off her wheel	St. Clair Flats canal.
———		Str. C. O. Jenkins	Grounded; had to lighter	Cleveland harbor.
June	26	Str. Bothnia	Collided with Str. Curry and nearly cut in two; one of crew drowned; total loss	St. Clair river near Star Island.
June	26	Str. S. S. Curry	Collided with Str. Bothnia when her rudder became disabled; hole 6 x 8 ft. in her side; towed to Milwaukee by Str. Favorite; new rudder put on	St. Clair river near Star Island.
June	27	Str. Sidney C. McLouth	Burned; total loss; crew rescued	Green bay.
June	27	Sch. Francomb	Became waterlogged after she struck a submerged object; 100,000 ft. of lumber lightered and towed to Buffalo by Str. Mohegan; lost cargo estimated at $30,000	Near Southeast Shoal, Lake Erie
June	28	Str. City of Montreal	Ran aground; out 30 in.; released on June 30 by three tugs	Maumee bay.
June	29	Str. James Corrigan	Collided with barge Alex. Maitland	Lower Detroit river.
June	29	Bge. Alex. Maitland	Collided with Str. James Corrigan; slightly damaged; docked at Cleveland July 3	Lower Detroit river.
June	30	Str. W. P. Snyder	Broke bolts in connecting rod of intermediate crank pin and cracked cylinder head; Str. Wilpen towed her to Ashtabula and from there to Ecorse for repairs; will need new cylinder head, connecting rod, piston rod and crank shaft; about two weeks to make repairs	Off Fairport, Lake Erie.
July	2	Str. Crete	Collided with Str. J. S. Dunham; five plates damaged and eight frames buckled on her bow; to be repaired at Toledo	Southeast Bend, St. Clair river.
July	2	Str. J. S. Dunham	Collided with Str. Crete; slightly damaged	Southeast Bend, St. Clair river.
July	3	Bge. Alfred Krupp	Ran aground; released on July 4 by tug, after lightering 100 tons; leaked; docked at Cleveland July 5	Ballard's Reef, Detroit, Mich.
July	5	Str. Viking	Ran ashore in dense fog; hold filled with water and reported by tugs to be in bad shape; probably will be abandoned as constructive total loss	Split Rock, Lake Superior.
July	6	Str. Columbia	Considerably damaged by fire and may be total loss	Near Ogdensburg.
July	7	Str. Normania	Ran aground	Ballard's Reef.

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Date.	Name of Vessel.	Nature of accident.	Location.
———	Str. J. B. Wood	Lost an anchor	Middle Neebish Channel.
July 7	Str. Merida	In leaving channel in dense fog, ran aground on Canadian side; released after lightering on July 8 and went to Cleveland	Soo.
———	Str. Adriatic	Hit the bridge pier and dented a few plates	Soo.
July 8	Str. Wainwright	Ran aground; released by a tug from Buffalo; slightly damaged	Point Abino, Lake Erie.
———	Str. H. P. Bope	Struck; released and docked at Superior; bottom badly stove in under boiler; 22 plates damaged; two weeks in dry dock; repairs completed on July 26	Ballard's Reef, Detroit river.
July 13	Bge. C. G. King	Crashed into east pier while entering lower end St. Clair Flats canal; bow smashed and seams opened; sank immediately; raised July 23, temporarily repaired and left for Port Huron to unload coal cargo	St. Clair river.
July 14	Str. G. J. Grammer	Collided with Str. Northern Queen in heavy fog; sank immediately in 27 ft. of water; floated on July 17 and was temporarily patched up at Port Huron; big break in side and decks badly damaged; docked at Cleveland July 22; will lose three weeks' time in making repairs	Near Corsica Shoal, Lake Huron
July 14	Str. Northern Queen	Collided with Str. G. J. Grammer in heavy fog; bow badly damaged; accident caused by parting of her wheel chains; temporarily repaired at Port Huron	Near Corsica Shoal, Lake Huron
July 14	Oil Bge. No. 96	Hit by Str. B. F. Jones on port side abreast of pump room; bulkhead leaked and considerable other damage done; temporarily repaired at Sault; to be docked at Cleveland	Near Poe Lock, Sault canal.
July 14	Str. W. K. Bixby	Hit lightship Kewaunee stationed at wrecked steamer Joliet when her steering gear gave out; floated over the Joliet, doing considerable damage; forepeak full of water; tmporarily patched at Port Huron and docked at Ashtabula on July 18; 70 plates damaged; will be out of commission about four weeks, and repairs will cost approximately $30.000	St. Clair river.
July 14	Str. W. L. Smith	Ran on east bank; released by tug after lightering 300 tons of ore; reloaded lightered cargo; not damaged	Limekiln Crossing, Detroit river.
July 14	Dredge	Sank in 70 ft. of water when line parted in storm; crew rescued.	Near Ontonagon, Lake Superior.
July 15	Str. J. B. Nielson	Ran aground near T. & O. C. docks; released by tugs	Toledo, O.
July 15	Str. W. H. Mack	Hit breakwater; lost her shoe and rudder damaged; arrived at Detroit in crippled condition, unloaded there, and was towed to South Chicago and docked; repairs completed July 30	Buffalo.
July 16	Str. India	Crashed into Grand Trunk Ry. bridge, putting structure entirely out of commission; vessel only slightly injured. Misunderstanding of signals said to have caused accident	Port Colborne, Ont.
July 16	Str. Flora	Sank at dock, seams opening	Saginaw river.
July 16	Str. Andrew Carnegie	Collided with Str. Iron King; four plates damaged; repaired at Cleveland	Detroit river.
July 16	Str. Iron King	Collided with Str. Andrew Carnegie; bow badly damaged; temporarily repaired at Detroit and took on steam pump to finish trip; left Detroit on July 18; docked at Manitowoc	Detroit river.
July 16	Str. Bulgaria	Hit by Str. Theodore Wickwire Jr., while unloading at elevator; dock somewhat damaged	Buffalo.
———	Str. Geronia	Struck in canal and was beached at Picton; floated on July 17 and docked at Montreal	Lachine canal.
———	Sch. Chippewa	Sprang a leak and had to be beached at Ashtabula	Lake Erie, near Ashtabula.
———	Sch. Rob Roy	Sank in harbor, loaded with coal	Kingston harbor.
———	Str. Rosedale	Hit a canal lock; docked at Kingston July 19	———
July 18	Str. Paipoonge	Struck; released herself on July 19	Middle Ground, St. Clair river.
July 19	Str. United Lumberman	Ran on reef; released	Dawson Rock, Georgian bay.
July 19	Bge. Jeanette	In tow of Str. United Lumberman and also ran on	Dawson Rock, Georgian bay.
July 20	Str. R. L. Agassiz	Collided with Bge. Magna; bows pretty badly damaged above water line; nine plates must be replaced	Detroit river.
July 20	Bge. Magna	Collided with Str. Agassiz (in tow of Str. Alex. McDougall); big hole in side; towed to Detroit for temporary repairs	Detroit river.
July 20	Str. Francis Widlar	Stranded; released on July 22 after lightering 350 tons of ore; not seriously injured	Marine City, St. Clair river.
July 20	Str. Parks Foster	Ran aground; released on July 22 after lightering 10,000 bu. of grain; not seriously injured	Ballard's Reef, Detroit river.
July 21	Str. C. H. Green	Struck obstruction; broke two buckets off her wheel and damaged a third; docked at Port Huron	Soo river.
———	Str. Mary McGregor	Machinery became disabled; repaired at Port Huron	———
July 23	Str. America	Ran aground; lightered 300 or 400 tons of ore; docked at Cleveland on July 25; 17 damaged plates; ten days in dry dock	Detroit river
July 23	Str. Ogdensburg	Ran ashore in fog; released on July 24 after lightering 400 tons; docked at Chicago and will be out of commission about three weeks; 42 plates to come off, 15 of which must be replaced with new; repair bill estimated at $20,000	North Point, Lake Michigan.
July 25	Str. Eastland	Ran on east end of breakwater; few plates damaged and rivets loosened	Cleveland breakwater.
———	Str. Britannia	Docked at Detroit for repairs to her wheel	———
———	Str. Gen. Garretson	Struck; docked at Lorain July 27 for repairs; 17 plates damaged.	Ballard's Reef, Detroit river.
———	Str. Westmount	Collided with Str. Turret Court; went to Port Arthur ship yard on July 27 for repairs	———
July 27	Str. Mataafa	Collided with Str. G. Watson French; arrived at Detroit in almost sinking condition, where she was temporarily repaired and left on July 29 for Toledo where she was docked; hull broken for a distance of 100 ft. on port side and deck forward bulged up; 50 frames damaged; will be about three weeks in dry dock; repair bill estimated at $25,000	Lake St. Clair, Off Grosse Point.
July 27	Str. G. Watson French	Collided with Str. Mataafa; disabled steering gear cause of accident; port bow stove in above water line; lost one anchor; went back to Ecorse for temporary repairs and then left for Fort William	Lake St. Clair, Off Grosse Point.
July 29	Str. Republic	Ran ashore in fog; released on July 30 after lightering 800 tons of ore; badly damaged forward and tank top sprung, causing water to enter cargo hold; temporarily repaired at Sault	Brush Point, St. Mary's river.
July 29	Bge. I. L. Bell	Hit by Str. Moses Taylor; three plates damaged, nine frames and eight deck beams; docked at Lorain	Lorain harbor.
July 29	Str. Amasa Stone	Backed into dock, breaking quadrant and damaging her rudder; will be delayed four or five days	Duluth.
———	Str. Theodore Roosevelt	Collided with tug Perfection; rudder damaged	Chicago.

Photographic Reference Library

The Detroit Publishing Co., Detroit, Mich., has for some time past been working upon a picture reference library, in which will be incorporated a somewhat elaborate marine division. This division will have several sections treating with noted historical scenes and ships, such as the Frigate Constellation, Nelson's Flagship Victory at Trafalgar. The second section would show the various types of naval vessels. A third section would display the merchant marine divided into ocean sail and steam types as well as lake.

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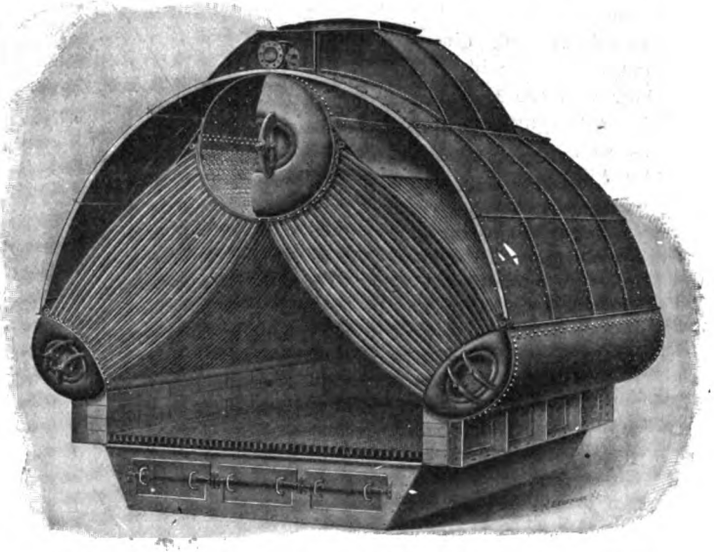

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Hollow Stay Bolt Iron

Falls hollow staybolt iron has been frequently tested as to tensile strength requirements, and found to exceed them in elongation and reduction of area, which indicates unusual ductility, the valuable quality desired in staybolt iron; and which enables this particular iron to far exceed the requirements of the vibration test. The specifications now in general use are those adopted by the American Society for Testing Materials, and these require a tensile strength not less than 48,000 lbs. per sq. in., not less than 28 per cent elongation in 8 in., and a reduction of area not less than 45 per cent. While Falls hollow staybolt iron may sometimes not exceed the limit for ultimate strength, the elongation in 8 in. in such cases is always 32 to 35 per cent. The vibratory tests in the same specifications require that the test bar shall endure a minimum of 6,000 revolutions when a threaded specimen fixed at one end has the other end moved in a circular path while under a tensile load of 4,000 lbs. The circle described shall have a radius of 3-32 at a point 8 in. from the fixed end of the specimen. Seven samples of Falls hollow staybolt iron were tested under the above conditions at Purdue University and the average number of revolutions required for rupture was 10,378. One sample endured over 13,000 revolutions and three over 10,000, while the lowest one required 8,339. The double bending test requires that the bar shall be closed in both directions without flaw. The illustrations show how well the Falls hollow specimen has met this requirement, as well as the more severe test by bending after the specimen was threaded.

Fig. 1 represents a bar 1⅛ in. in diameter, bent cold flat on itself and retaining a smooth surface with no rupture. The extreme ductility of this iron is shown by the distance the molecules had to float without rupture in following the curve described in bending the bar.

Fig. 2 represents a bar 1⅛ in. in diameter nicked 1/16 in. deep one-half way around and bent flat on itself to produce rupture and show the fibrous structure of the iron and the stretch at the hollow portion. It also shows the standard V thread, 12 per in., when bent flat on itself. Although each thread is the equivalent to the nick which ruptured the other end, no rupture is readily apparent, there being very minute ruptures at the base of every thread, thus demonstrating the complete uniformity of the fibrous structure.

The advantage of the hollow feature of this material is of special interest since the passage of the federal boiler

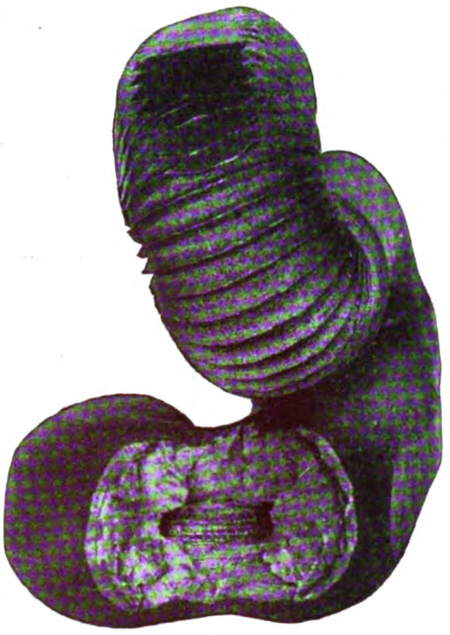

FIG. 2.

Inspection Act, as the rules adopted for the enforcement of that act have certain requirements which are most easily and

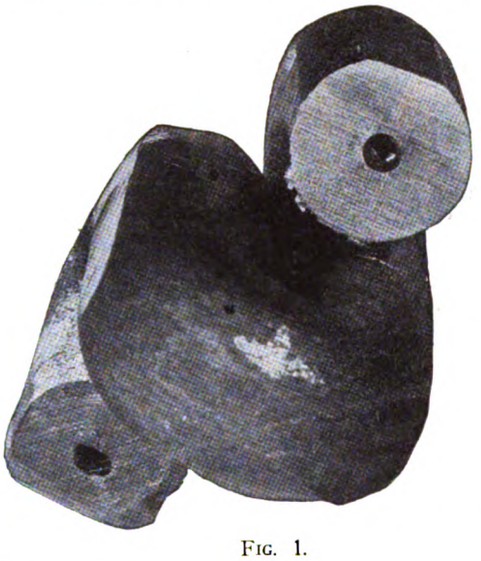

FIG. 1.

economically met by hollow staybolt iron. One of these rules requires that all staybolts shorter than 8 in. applied after July 1, 1911, except flexible staybolts, shall have tell-tale holes 3/16 in. in diameter, not less than 1¼ in. deep in the outer end, and these holes must be kept open at all times. As is well known, the Falls hollow staybolt iron has 3/16 in. holes clear through, so that the time and expense required for drilling every staybolt is avoided by the use of the hollow bolt.

Life Raft of Perry Design

The La Favorite Rubber Mfg. Co., Paterson, N. J., manufacturer of Perry's specialties, are endeavoring to revive interest in life rafts of design similar to Perry's raft Nonpareil, which crossed the Atlantic ocean in 1867. The Nonpareil left Southampton on June 12 and arrived in New York on July 26. The raft is constructed of either two or three cylinders, which can be inflated by hand or compressed air. It is claimed for the rafts that they cannot be swamped or capsized in a seaway or in the breakers. The capacity of the two-cylinder raft is 11,500 lb., and the three-cylinder 17,000 lb. The Nonpareil which crossed the ocean was schooner-rigged. The great interest now obtaining in life-saving equipment, owing to the Titanic disaster, has caused the La Favorite company to revive interest in the device.

Straus Bascule Bridge

The Straus design of bascule bridge was displayed in model form at the recent convention of the International Navigation Congress in Philadelphia and was inspected quite generally by the delegates. This type of bridge has recently been adopted by the Great Northern railroad for a 200 ft. single leaf double track bridge over the Salmon Bay waterway at Seattle; by the Northern Pacific for a 190 ft. single leaf, single track bridge at Seattle and by the Houston Belt and Terminal railway for a 116 ft. 6 in. single leaf bridge over Buffalo bayou at Houston, Texas.

The Duff Mfg. Co., of Pittsburgh, Pa., exclusive manufacturer of Barret lifting jacks, have purchased five acres of ground on Preble avenue, Northside, Pittsburgh, on the lines of the Pennsylvania and Baltimore & Ohio railroads, and will start at once the erection of a new factory, which it is said will be the largest in the world devoted exclusively to the manufacture of lifting jacks.

Recording compasses furnished by the Schuette Recording Compass Co., of Manitowoc, Wis., are being installed on the new passenger steamer Tabora, of the German East African Line, and on the Professor Worman, of the Worman Line.

The Fumigating & Fire Extinguishing Co. of America, 29 Broadway, fumigated the steamer Denver, of the Mallory Line, recently.

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